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PERIOD OF PRODUCTION, DURABILITY, AND THE RATE OF INTEREST IN THE ECONOMIC EQUILIBRIUM

I

IT IS the aim of this essay to analyze the parts played by period of production and durability in the pricing-process and to deduce the relationships existing between these time magnitudes and the other magnitudes in the pricing-process. For solving the problem we will start with a certain representation of the process of production, which is common to some leading explanations of the general process of price determination in economic theory. It will be shown that this representation of the process of production as a part of the general pricing-process is only valid on the assumption that the phenomena of time of production and durability are left out of account. Then we shall attempt to extend the analysis and make it include priced objects which require a time of production or have durability. Fitting the results into a general explanation of the pricing-process does, however, not fall within the scope of the present paper.

G. Cassel,[1] in his explanation of the pricing-process, starts from a stationary economy. This is characterized by the fact "that the social process of production remains completely unchanged as time goes on."[2] The same acts of production, then, permanently recur in every unit of time. This unit of time may be called a

[1] Gustav Cassel, *The Theory of Social Economy* (London, 1923).

[2] *Ibid.*, p. 29.

"unit-period" and "may, if the productive process is sufficiently uniform, be made as short as we choose; it may, according to the problem in hand, represent a day, a week or a year."[3] Cassel represents the process of production per unit-period as follows:[4]

$$
\begin{aligned}
R_1 &= a_{11}S_1 + a_{21}S_2 + \cdots\cdots a_{n1}S_n \\
R_2 &= a_{12}S_1 + a_{22}S_2 + \cdots\cdots a_{n2}S_n \\
&\vdots \\
&\vdots \\
R_r &= a_{1r}S_1 + a_{2r}S_2 + \cdots\cdots a_{nr}S_n
\end{aligned}
\qquad (1)
$$

In this system of equations the magnitudes $R_1 \ldots . R_r$ represent the total amount of the means of production (1) . . . . (r) used and priced in every unit-period; $S_1 \ldots . S_n$ represent the total amount of the finished products (1) . . . . (n) produced and priced in every unit-period; the magnitudes a are called technical coefficients and indicate the number of units of each means of production (second index, 1 . . . . r) required for the unit quantity of each product (first index, 1 . . . . n).

In the stationary process of production, for reasons not further to be discussed here, the principle of cost is fulfilled; i.e., the price of each product equals exactly the sum of all prices of means of production used for making it. Cassel expresses the cost equation as follows:

$$
\begin{aligned}
a_{11}q_1 + a_{12}q_2 + \cdots\cdots + a_{1r}q_r &= p_1 \\
a_{21}q_1 + a_{22}q_2 + \cdots\cdots + a_{2r}q_r &= p_2 \\
&\vdots \\
&\vdots \\
a_{n1}q_1 + a_{n2}q_2 + \cdots\cdots + a_{nr}q_r &= p_n ,
\end{aligned}
\qquad (2)
$$

where $q_1 \ldots . q_r$ represent the prices of the unit of each means of production (1) . . . . (r); $p_1 \ldots . p_n$ the prices of the unit quantity of each product (1) . . . . (n).

If we multiply the single equations of system (1) by the prices of the means of production $q_1 \ldots . q_r$, and in the same way

[3] *Ibid.*, p. 139. [4] *Ibid.*, p. 142.

system (2) by the total quantities $S_1 \ldots S_n$ of the products, we may express the relationships in one single system of equations as follows:

$$
\begin{array}{lccccc}
 & R_1q_1 = a_{11}S_1q_1 + a_{21}S_2q_1 + \cdots & & & a_{n1}S_nq_1 \\
 & + & + & & + \\
 & R_2q_2 = a_{12}S_1q_2 + a_{22}S_2q_2 + \cdots & & & a_{n2}S_nq_2 \\
 & + & + & & + \\
\text{(I)} & \vdots & \vdots & \vdots & \vdots \\
 & \vdots & \vdots & \vdots & \vdots \\
 & R_rq_r = a_{1r}S_1q_r + a_{2r}S_2q_r + \cdots & & & a_{nr}S_nq_r \\
 & \| & \| & & \| \\
 & S_1p_1 & S_2p_2 & & S_np_n
\end{array}
$$

This system of equations, to which we shall refer frequently in our later arguments, is indeed common to all explanations which attempt to express the relationships in an exact manner. It could as easily be deduced from Walras or Pareto as from Cassel. The foundations upon which it rests are: (1) a stationary process of production, divided up into unit-periods, the data of the system as a whole being constant as time goes on; (2) the notion of "technical coefficients"; (3) the assumption of the cost equation as a basis for the explanation of the pricing-process under static conditions.

It may be emphasized once more that this system of equations must be interpreted as having reference to time; i.e., it must be looked upon as representing the process of production proceeding *through a unit-period*, the length of which may be arbitrarily chosen. This reference of the system to a unit of time will be of great importance in our later arguments.

In the general explanation of the pricing-process the following question must be broached: Which of the magnitudes met with in the system of equations can be regarded as given magnitudes, and which magnitudes stand on a par with the prices as unknowns? Modern theory regards all interdependent magnitudes, i.e., all magnitudes that are not determined independently of any price phenomenon, as on the same level with the unknowns. In this article, this question need not be discussed in relation to the

R's and S's but only with regard to the technical coefficients. Even in the problem of production as a special subproblem within the whole of price determination, the technical coefficients cannot be regarded as given magnitudes, because they themselves bear a functional relation to the unknowns of the problem, i.e., the prices of the means of production and the price of the product. We express this dependence by a system of equations, in which the technical coefficients are represented as functions of the prices as follows:

$$
\begin{aligned}
&a_{11}=f_{11}(q_1,q_2 \ldots . q_r,p_1)\\
&a_{12}=f_{12}(q_1,q_2 \ldots . q_r,p_1)\\
&\vdots\\
&\vdots\\
&a_{21}=f_{21}(q_1,q_2 \ldots . q_r,p_2)\\
&a_{22}=f_{22}(q_1,q_2 \ldots . q_r,p_2)\\
&\vdots\\
&\vdots\\
&\vdots\\
&a_{nr}=f_{nr}(q_1,q_2 \ldots . q_r,p_n)
\end{aligned}
\qquad \text{(II)}
$$

The idea that lies at the bottom of the system (II) seems to us to be commonly recognized. Walras[5] defines: "... les coefficients de fabrication, c'est à dire, les quantités respectives de chacun des services producteurs (T), (P), (K) ... qui entrent dans la confection d'une unité de chacun des produits (A), (B), (C), (D) ... ," and then expresses the idea in question as follows:

Nous supposons, comme on voit, les coefficients a_t, a_p, a_k ... b_t, b_p, b_k ... c_t, c_p, c_k ... d_t, d_p, d_k ... déterminés a priori. En réalité ils ne le sont pas: on peut employer, dans la confection d'un produit, plus ou moins de tels ou tels services producteurs, par exemple, plus ou moins de rente, à la condition d'y employer moins ou plus de tels ou tels autres services producteurs, par exemple moins ou plus de profit ou de travail. Les quantités respectives de chacun des services producteurs, qui entrent ainsi dans la confection d'une unité de chacun des produits ne sont déterminées qu'après la détermination des [4me édition: "en même temps que les ..."] prix des services producteurs

[5] Léon Walras, *Éléments d'économie politique pure*, (3me édition; Lausanne, 1896), p. 231.

par la condition que le prix de revient des produits soit minimum. Il serait facile, d'exprimer cette condition par un système d'autant d'équations qu'il y a de coefficients de fabrication à déterminer. Nous en faisons abstraction, pour plus de simplicité, en supposant que les coefficients ci-dessus figurent parmi les données et non parmi les inconnues du problème.[6]

As the foregoing quotation shows, Walras recognizes the dependence of the technical coefficients. That Pareto regards the technical coefficients in the same way is evident from the fact that he applies to the "*obstacles*" also his idea of "*lignes d'indifférence*," by which he explains the dependence of the "*goûts*" on the pricing-process.[7] Later on he states expressly:[8]

La plupart des économistes, qui font usage de la théorie des proportions définies paraissent croire qu'il existe certaines proportions en lesquelles il convient de combiner les facteurs de la production, indépendamment des prix de ces facteurs. C'est faux ... ces rapports ne sont pas seulement variables avec les prix des facteurs de la production, ils sont encore variables avec toutes les circonstances de l'équilibre économique.

Cassel, from whose representation we deduced the first system of equations, maintains expressly that the technical coefficients are given magnitudes:[9] "These quantities [technical coefficients] . . . . represent the technical conditions of production. As we have assumed these conditions to be fixed, the technical coefficients are to be regarded as given magnitudes of the problem." But he reintroduces their dependence on the prices in the form of the principle of substitution. When discussing this, he admits that "the situation . . . . is such, that . . . . the choice of the method of production is not independent of the prices of the means of production, and there is a certain indetermination in the pricing problem."[10] The determinateness, according to Cassel, is restored by the principle of substitution which contains "the requirement, that the cheapest method of production is to be chosen."[11] "The test of the cheapest method . . . . is, that the

[6] *Ibid.*, p. 232.

[7] Vilfredo Pareto, *Manuel d'économie politique* (Paris: Giard, 1909; and 2me édition, Paris, 1927), p. 177.

[8] *Ibid.*, p. 327.

[9] *Op. cit.*, p. 139.

[10] *Ibid.*, p. 106.

[11] *Ibid.*, p. 106.

last quantities of the two means of production, employed in production and mutually substitutable, shall have the same price."[12]

II

The thesis of this essay can now be formulated as follows: The relationships between the prices of the means of production and the prices of the products, expressed by equation system (I), apart from the assumption of static conditions, are only true under the further assumption that none of the priced objects—neither means of production nor product—has a time of production or a durability. If these magnitudes, time of production, and durability are introduced, a similar position is due to them as to the technical coefficients, and the whole system has to be rearranged. If the relationships stated in system (I) are to be generally true, the process of production must be timeless; it must consist only of transforming into immediately consumable services the various means of production, not themselves produced, and hereafter called "original means of production," i.e., the use of land and labor in a broader sense, including all personal work.

Let us proceed to prove this thesis. Let us regard the equation system (I) as including only original means of production, and valid only for timeless production. Under static assumptions, i.e., assuming the data determining the system as a whole to be constant as time goes on, in a longer period of time more original means of production—human efforts and uses of land—will enter the process of production and proportionately more products will emerge or fall out. The recurrence of the same acts of production per unit of time, then, follows from assuming the data constant, however we choose the unit-period. Independently of the length of this period the equation system (I) holds true. It shows the process of production through an arbitrarily chosen unit-period, and this unit-period will be representative for all periods of the same length in the continuous process of production, beginning today and going on forever under static assumptions.

Now let us consider one of the products, say (1) requiring an arbitrarily chosen time of production, which may be designated

[12] *Ibid.*, p. 108. Cf. also, H. Schultz, "Marginal Productivity and the General Pricing Process," *Journal of Political Economy*, October, 1929.

by z. A process of production for S_1 units of (1), started at any time, after a period of time of $z/2$, does not allow S_1 of (1) to fall out, but intermediate products, say (1_I) in the same number, i.e., $S_1(1_I)$. The process of production, with regard to these special products, in the second half of the time z will now differ from the process of production during the first half. In the first part, original means of production were combined into intermediate products; in the second part, intermediate products and other original means of production are combined into final products. With regard to this special production, the acts of production, met with in the first half of the time z, do not recur in the second one. Socially viewed, however, a stationary process of production can be further assumed under the condition that at the assumed starting-moment S_1 intermediate products (1_I) have been at hand. The two acts of production—(1) conversion of original means of production into intermediate products and (2) conversion of original means of production and intermediate products into final products —can then be assumed to take place simultaneously. At the end of $z/2$, $S_1(1_I)$ again fall out of the process of production, and in the second half of the time z we have again the two processes of production simultaneously side by side. The same number of units of intermediate products thus is permanently met with in a stationary process of production.

Generalizing, we may say: In the case of products requiring a time of production, we can imagine a constant recurrence of the same acts of production per unit-period under the assumption that at the starting-moment all products are simultaneously at hand in every stage of completion in the same number of units. Let us assume we have two products, (1) and (2) requiring a time of production of respectively two and three days, the number of units being S_1 and S_2. A day may be chosen as unit-period. In order to make the process of production identical for successive days, it must be assumed that at any moment chosen as starting-moment for the stationary process of production, there are at hand S_1 units of product (1) in the stage it reaches after one day, S_2 units of product (2) in the stage it reaches after one day and also S_2 units of (2) in a stage it reaches after two days from the beginning of its production.

In the pricing-process of every unit-period every intermediate product must be priced twice—one price referring to the unit at hand at the beginning of the period and entering the process of production as means of production (*price of use*); the second price referring to the unit falling out of the process of production at the end of the period (*price of reproduction*). Since the process of production and pricing is continuous, every intermediate product produced in one unit-period enters the process of production in the next as produced means of production. Its price of reproduction in one unit-period, therefore, coincides in time with its price of use in the next.

Price of use and price of reproduction of an intermediate product refer obviously to two objects which are alike with regard to all their characteristics of relevance in the pricing-process except their temporal characteristics. In this they differ, since one object is ready to enter the process of production at a moment one unit-period earlier than the other. If there is a difference between price of use and price of reproduction, it can be attributed to the temporal characteristics of the priced objects; it is a price for time.

We have to investigate the *relationship between price of use and price of reproduction* of intermediate products. If the social organization in our imagined stationary society is such that all priced objects are subject to a private right of disposition, this applies also to the intermediate product. The economizing individual, by whom the intermediate product at an arbitrarily chosen starting-moment of the stationary state is disposed of, is hereafter called *capitalist.*

Price of use and price of reproduction must each be constant as time goes on for every intermediate product. The difference between them, if there is any, then constitutes an income constant for every unit-period accruing to the capitalist in the moment in which one unit-period passes into the next. Suppose price of use, price of reproduction, and the capitalist's income not to be constant, a stationary economy cannot be thought of. The constancy depends upon a certain behavior and a continuous repetition of the capitalist's behavior with regard to his acts of production and consumption in every unit-period. This corresponds to the way in which the whole stationary state is based upon the assumption

of a continuous repetition of the acts of price relevance on the side of every economizing individual. If we have a shrinkage of the amount of labor or use of land available in any unit-period, or an act of new saving, the stationary process of production is disturbed.

For the establishment of the stationary state, then, the capitalist must dispose of his intermediate product in such a way that he too can offer the same use of the intermediate product even in the second, third, and every following unit-period. He can do that only by always reproducing the intermediate product, whose use he offers, in the current period. Let us take as an example the capitalist owning intermediate product (1_1). Out of his gross earnings per unit-period equaling the price of use and hereafter designated by l_{11}, he has to devote an amount equaling the price of reproduction and hereafter designated by k_{11} to the reproduction of his income source. By doing so, he enables himself to dispose of the same intermediate product at the beginning of the next unit-period, and so on. His income per unit-period and per unit of the intermediate product therefore is

$$l_{11}-k_{11}\,.$$

The stationary state is established only if the capitalist continuously behaves in this way: offering the use of the intermediate product at the price of l_{11}, reproducing it at the price of k_{11} and consuming $l_{11}-k_{11}$. Let us put the equation:

$$l_{11}-k_{11}=i_{11}k_{11}\,.$$

Since l and k are constant, i is also constant for every intermediate product in every unit-period. Obviously, then, i is the factor, the multiplication of which with the price of reproduction of the intermediate product gives the capitalist's constant and stationary income per unit-period.

We pass to x products with a time of production $z_1 \ldots . z_x$. The number of intermediate products in production of product. $(1) \ldots . (x)$ then is respectively $(z_1-1) \ldots . (z_x-1)$. Indicating by corresponding indices the prices of use (l), the prices of reproduction (k) and the factors (i) we get:

for product (1):

$$l_{11}-k_{11}=i_{11}k_{11}$$
$$l_{111}-k_{111}=i_{111}k_{111}$$
$$\vdots$$
$$\vdots$$
$$l_{1(z_1-1)}-k_{1(z_1-1)}=i_{1(z_1-1)}k_{1(z_1-1)}$$

for product (2):

$$l_{21}-k_{21}=i_{21}k_{21}$$
$$l_{211}-k_{211}=i_{211}k_{211}$$
$$\vdots$$
$$\vdots$$
$$l_{2(z_2-1)}-k_{2(z_2-1)}=i_{2(z_2-1)}k_{2(z_2-1)}$$

for product (x):

$$l_{x1}-k_{x1}=i_{x1}k_{x1}$$
$$l_{x11}-k_{x11}=i_{x11}k_{x11}$$
$$\vdots$$
$$\vdots$$
$$l_{x(z_x-1)}-k_{x(z_x-1)}=i_{x(z_x-1)}k_{x(z_x-1)}$$

Later on in this paper for the sake of simplicity we shall designate a system of equations like this by one representative equation as follows:

$$l_{xz}-k_{xz}=i_{xz}k_{xz}$$

$$\begin{pmatrix} z: 1 \ldots (z_1-1); \ldots ; 1 \ldots (z_x-1) \\ x: \quad 1 \quad ; \ldots ; \quad x \end{pmatrix}.$$

The maximum amount of income will be gained by every capitalist by investing his prices of use continuously accruing to him in form of money in the intermediate product yielding the largest income. This will lead to an adjustment of the incomes according to the following equation:

$$\frac{l_{11}-k_{11}}{k_{11}}=\frac{l_{111}-k_{111}}{k_{111}}=\ldots\ldots=\frac{l_{21}-k_{21}}{k_{21}}=\frac{l_{211}-k_{211}}{k_{211}}\ldots\ldots\frac{l_{x(z_x-1)}-k_{x(z_x-1)}}{k_{x(z_x-1)}}.$$

For if, e.g., $\frac{l_{11}-k_{11}}{k_{11}}>\frac{l_{111}-k_{111}}{k_{111}}$, it would be more profitable for the

owner of (1_{II}) to invest his prices of use continuously accruing to him in the intermediate product (1_I). If $\frac{l_{11}-k_{11}}{k_{11}} < \frac{l_{1II}-k_{1II}}{k_{1II}}$, a corresponding additional investment in (1_{II}) would follow. In both cases a disarrangement of the stationary process of production would take place. The same holds true with regard to any two terms in the foregoing equation. The fulfilment of the preceding equation is a necessary condition of a stationary state under the assumption that the maximum value of income out of a right of disposition over reproducible capital goods is strived for by the capitalists.

From the foregoing equation system it follows that

$$\frac{i_{11}k_{11}}{k_{11}} = \frac{i_{1II}k_{1II}}{k_{1II}} = \cdots \frac{i_{21}k_{21}}{k_{21}} = \frac{i_{2II}k_{2II}}{k_{2II}} = \cdots \frac{i_{z1}k_{z1}}{k_{z1}} = \cdots \frac{i_{z(z_z-1)}k_{z(z_z-1)}}{k_{z(z_z-1)}}$$

$$i_{11} = i_{1II} \quad = \cdots \quad i_{21} = i_{2II} \quad = \cdots \quad i_{z1} = \cdots i_{z(z_z-1)} .$$

Therefore i is a constant factor over the whole field of reproduction, applicable to all intermediate products in different productions as well as in different stages of production within the same production. With the aid of this constant factor we may express every price of use by the corresponding price of reproduction and inversely as follows:

$$l_{xz} - k_{xz} = i \cdot k_{xz} \; ; \qquad l_{xz} = k_{xz}(1+i) \; ; \qquad k_{xz} = \frac{l_{xz}}{(1+i)} \; ;$$

$$\begin{pmatrix} z: 1 \ldots (z_1-1); \ldots ; 1 \ldots (z_x-1) \\ x: \quad 1 \quad ; \ldots ; \quad x \end{pmatrix} .$$

Let us follow up the productive process of product (1) with the time of production z_1 from its beginning to its end. For this purpose the technical coefficients must be divided up into "successive rates of production," indicating the rates of the technical coefficients respectively required in the first, second, ... , zth unit-period. The successive rates of production for product (1) may be indicated by the indices of their unit-period $1 \ldots z_1$, as follows:

$$a_{111}+a_{111\text{II}}+\cdots\cdots a_{111_{z_1}}=a_{11}$$
$$a_{121}+a_{121\text{II}}+\cdots\cdots a_{121_{z_2}}=a_{12}$$
$$\vdots$$
$$\vdots$$
$$a_{1r1}+a_{1r1\text{II}}+\cdots\cdots a_{1rz_r}=a_{1r}$$

For the continuous production of the intermediate product (1_{I}) in the number of S_1 units, only original means of production are used, i.e., the first rates of production having the index 1. For making the second intermediate product (1_{II}), the first intermediate product is required plus the second rates of production (index II). The final product finally is composed of the last intermediate product (index (z_1-1)) and the last rates of production (index z_1). Each single product goes through all stages of production in successive unit-periods. In a continuous process of production, however, all these acts of production take place in the same unit-period simultaneously contiguous. So we get the series of equations:

$$\begin{aligned}
&a_{111}S_1q_1+a_{121}S_1q_2+\cdots\cdots a_{1r1}S_1q_r=S_1k_{11}\\
S_1l_{11}\quad&+a_{111\text{II}}S_1q_1+a_{121\text{II}}S_1q_2+\cdots\cdots a_{1r\text{II}}S_1q_r=S_1k_{1\text{II}}\\
&\vdots\\
&\vdots\\
S_1l_{1(z_1-1)}&+a_{111_{z_1}}S_1q_1+a_{121_{z_2}}S_1q_2+\cdots\cdots a_{1rz_r}S_1q_r=S_1p_1
\end{aligned}$$

We substitute for every l the corresponding k multiplied by $(1+i)$. The last equation of the series, then, reads:

$$\begin{aligned}
p_1=&(a_{111}q_1+a_{121}q_2+\cdots\cdots a_{1r1}q_r)(1+i)^{(z_1-1)}\\
&+(a_{111\text{II}}q_1+a_{121\text{II}}q_2+\cdots\cdots a_{1r\text{II}}q_r)(1+i)^{(z_1-2)}\\
&+\cdots\cdots\\
&+(a_{111_{z_1}}q_1+a_{121_{z_2}}q_2+\cdots\cdots a_{1rz_r}q_r)
\end{aligned}$$

Expressing in the same way all prices of all final products with the times of production $z_1\ldots.z_x$, we get a system of equations:

$$\begin{aligned}
p_2=&(a_{211}q_1+a_{221}q_2+\cdots\cdots a_{2r1}q_r)(1+i)^{(z_2-1)}\\
&+(a_{211\text{II}}q_1+a_{221\text{II}}q_2+\cdots\cdots a_{2r\text{II}}q_r)(1+i)^{(z_2-2)}\\
&+\cdots\cdots\\
&+(a_{211_{z_1}}q_1+a_{221_{z_2}}q_2+\cdots\cdots a_{2rz_r}q_r)\\
&\vdots
\end{aligned}$$

(III)

$$\begin{aligned}
&\vdots\\
&\vdots\\
p_x = {} & (a_{x11}q_1 + a_{x21}q_2 + \cdots a_{xr1}q_r)(1+i)^{(s_x-1)}\\
& + (a_{x111}q_1 + a_{x211}q_2 + \cdots a_{xr11}q_r)(1+i)^{(s_x-2)}\\
& + \cdots\\
& + (a_{x1s_x}q_1 + a_{x2s_x}q_2 + \cdots a_{xrs_x}q_r)
\end{aligned}$$

In this system of equations the prices of all final products, with any time of production whatever, are expressed in terms of the prices of original means of production, with the aid of the successive rates of production, the factor i, and the times of production, measured as a multiple of an arbitrarily chosen unit-period.

For expressing a little more simply this complicated system of equations let us consider a special case, upon which to base our further deductions. Let us assume that the successive rates of production are equal in every time-taking production. According to this assumption, original means of production of the same kind and in the same number of units are required for every product in every stage of production. If for a certain article there are ten days of labor required during the first phase of production, our assumption says that ten days of labor are required during the second, third, and every following period during the time of production. Then we have:

$$a_{xr1} = a_{xr11} = \cdots a_{xrs_x} = a_{xr}$$

$$\begin{pmatrix} r : 1 \ldots r ; \ldots ; 1 \ldots r \\ x : \quad 1 \quad ; \ldots ; \quad x \end{pmatrix}$$

The single equations of system (III) may be transformed under this assumption as follows:

(IV)

$$\begin{aligned}
p_1 \frac{i}{(1+i)^{s_1}-1} &= a_{11}q_1 + a_{12}q_2 + \cdots a_{1r}q_r\\
p_2 \frac{i}{(1+i)^{s_2}-1} &= a_{21}q_1 + a_{22}q_2 + \cdots a_{2r}q_r\\
&\vdots\\
&\vdots\\
p_x \frac{i}{(1+i)^{s_x}-1} &= a_{x1}q_1 + a_{x2}q_2 + \cdots a_{xr}q_r
\end{aligned}$$

The right-hand members of this system of equations (IV) are in conformity with the vertical columns of system (I) or the cost equations of system (2). The a's represent the quantities of the single means of production (second index 1 . . . . r) required for the production of the single products (first index 1 . . . . x), but, no longer the total quantity, only the quantity required per unit-period. The left-hand members of system (IV), however, differ essentially from system (I). They include, beside the prices p, the factor i and the times of production z_1 . . . . z_x. In any production the means of production must at least be ready for disposition before the moment of production. Even if the interval be very small, some time, however little, is required. Timeless production cannot exist. Since we may choose our unit-period as short as we like, it is advisable to equal it to the smallest conceivable period of time. Our system of equations (IV) is then generally applicable. It contains system (I), vertical columns, or the cost equations of system (2), from which we started, for $z_1 = \ldots . z_n = 1$. For $z = 1$, the factor of p equals 1.

Our formula therefore applies to all the n products of system (I). The number x of the products produced in a time-requiring process equals the number n of all products. System (IV) is a correct formulation of the cost equation for any time of production $\geqq 1$. It has to replace the vertical columns of system (I). The significance of this will be discussed later.

It may be repeated that this simple way of expressing the relationships is only possible under special assumption with regard to the equality of the successive rates of production. Dropping this assumption would not, however, mean an alteration of our statements in principle, but would only require a more complicated way of expressing them. The equation system (IV) would have to be replaced by system (III).

III

We have shown, first of all, which modifications of equation system (I) are necessary to make it include the case of time-taking production. While so doing, we still assumed all products to yield their uses in one moment, having no durability. This assumption is now to be dropped, first for one product. Let us assume the

durability of product (1) to be two unit-periods. With regard to the same durable object the process of production and wear in two successive unit-periods differs. For in the second unit-period the product yields a use different from the use yielded in the first period. Further, the whole product need not be replaced before the end of the second period; i.e., it must be reproduced during the second period. In spite of that, the process of production and wear viewed as a whole can be thought of as stationary, if, at the beginning of the first period, products just reproduced and "*partially worn*" are at hand side by side in the same number of units, and if the same number of units is reproduced in every unit-period. If so, both kinds of use are simultaneously yielded during the first period, the products yielding the first kind of use automatically become partially worn products, and new products fall out of the process of production. For the second period the same stock of capital goods is at hand and the same processes of production and wear go on. Partially worn products obviously have a position similar to that of intermediate products. The term "capital-goods," when used hereafter, may include both of them.

Let us again express the results in general terms. In the case of products having durability, we can imagine a constant recurrence of the same acts of production and consumption only if we assume that at the starting-moment of the stationary state all durable products are simultaneously at hand in every stage of exhaustion in the same number of units. Let us assume that we have two products, (1) and (2), having a durability of respectively 2 and 3 days, the number of units being S_1 and S_2. A day may be taken as the unit period. In order to make the process of production and wear identical for successive days, it must be assumed that at any moment, chosen as the starting-moment, there are at hand S_1 units of product (1) in a stage of reproduction just finished, and S_1 units of product (1) in the stage reached after a use of one day; of product (2) there must be at hand S_2 units in the stage of reproduction just finished, S_2 units in the stage reached after it has been in use one day and S_2 units in the stage reached after it has been in use two days. A continuous reproduction of the quantities S_1 and S_2 thus requires the same means of production in every unit-period, keeps the stock of capital goods unaltered from unit-

period to unit-period, and makes the process of production and consumption stationary. In a stationary process of production there exists a specific *relationship between the prices of use, the prices of reproduction of durable goods, and the prices of partially worn products*. That we will now deduce.

In a society that acknowledges a private right of disposition over priceable objects, the durable goods and the partially worn products are also subject to this right. The persons disposing of the durable and partially worn objects at the starting-moment of the stationary process of production and pricing are hereafter called "capitalists." Like all economizing individuals in the stationary economy, the capitalists must be assumed to preserve an unaltered income-earning capacity. They will offer in every unit-period the same uses out of their stock of capital-goods, replenishing it again and consuming the income yielded entirely. The replenishment may be done either by material reproduction or by purchase of a similar unit.

With regard to the product (1) with the durability 2 there exist two groups of capitalists: the capitalists of the first group own the products (1) just reproduced; those of the second group own the partially worn products (1_I), both in the number of units S_1. We designate hereafter by l_{1I} and l_{1II} the two prices of use of the durable instrument, by k_{1I} the price of the partially worn product in the stage between the first and second use. A capitalist of the first group, owning one unit of (1) will draw a gross income in the first unit-period of

$$l_{1I}+k_{1I}\ ,$$

l_{1I} being the price of the first use of the product just reproduced, k_{1I} resulting from the sale of the remaining partially worn product (1_I). In a stationary process of production he has to spend p_1, the price of reproduction of his original capital good, in order to preserve his stock of income-earning-capacity unaltered from unit-period to unit-period. His net income therefore is:

$$l_{1I}+k_{1I}-p_1=i_{1I}p_1\ .$$

The capitalist of the second group will continuously get l_{1II} as the

price of use; he must spend k_{11}. The price of the remainder after the second and last use is 0. His stationary income will be:

$$l_{111}+0-k_{11}=i_{111}k_{11}\ .$$

Let us proceed to y products with a durability $t_1 \ldots . t_y$. We designate by

$$\begin{array}{l} l_{11} \ldots . l_{1t_1}\ , \\ l_{21} \ldots . l_{2t_2}\ , \\ \ldots\ldots \\ l_{y1} \ldots . l_{yt_y} \end{array}$$

the prices of the successive uses of the durable products (first index 1 . . . . y) from the first to the last unit-period of their durability (second index 1 . . . . t_1, 1 . . . . t_2 . . . . 1 . . . . t_y). By

$$\begin{array}{l} k_{11} \ldots . k_{1(t_1-1)} \\ k_{21} \ldots . k_{2(t_2-1)} \\ \ldots\ldots \\ k_{y1} \ldots . k_{y(t_y-1)} \end{array}$$

we designate the prices of the partially worn products after the use has been made of which they were capable in every unit-period of their durability. After the last use in the t_1^{th} . . . . t_y^{th} unit-period of their durability they are worn out. Their price is 0. They must be reproduced at the price of $p_1 \ldots . p_y$. We can derive, in the same way as we did above, the equations:

for product (1):

$$\begin{array}{l} l_{11}+k_{11}-p_1=i_{11}p_1 \\ l_{111}+k_{111}-k_{11}=i_{111}k_{11} \\ \ldots\ldots\ldots\ldots \\ l_{1t_1}+0-k_{1(t_1-1)}=i_{1t_1}k_{1(t_1-1)} \end{array}$$

for product (2):

$$\begin{array}{l} l_{21}+k_{21}-p_2=i_{21}p_2 \\ l_{211}+k_{211}-k_{21}=i_{211}k_{21} \\ \ldots\ldots\ldots\ldots \\ l_{2t_2}+0-k_{2(t_2-1)}=i_{2t_2}k_{2(t_2-1)} \end{array}$$

for product (y):

$$l_{y1}+k_{y1}-p_y=i_{y1}p_y$$
$$l_{yII}+k_{yII}-k_{y1}=i_{yII}k_{y1}$$
$$\cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot$$
$$l_{yt_y}+o-k_{y(t_y-1)}=i_{yt_y}k_{y(t_y-1)}$$

Under assumptions corresponding to those in section II the equation must be fulfilled:

$$\frac{l_{1I}+k_{1I}-p_1}{p_1}=\frac{l_{1II}+k_{1II}-k_{1I}}{k_{1I}}=\ \cdots\ \frac{l_{1t_1}+o-k_{1(t_1-1)}}{k_{1(t_1-1)}}$$
$$=\frac{l_{2I}+k_{2I}-p_2}{p_2}=\frac{l_{2II}+k_{2II}-k_{2I}}{k_{2I}}=\ \cdots\ \frac{l_{2t_2}+o-k_{2(t_2-1)}}{k_{2(t_2-1)}}$$
$$=\cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot$$
$$=\frac{l_{yI}+k_{yI}-p_y}{p_y}=\frac{l_{yII}+k_{yII}-k_{yI}}{k_{yI}}=\ \cdots\ \frac{l_{yt_y}+o-k_{y(t_y-1)}}{k_{y(t_y-1)}}$$

If $\frac{l_{1I}+k_{1I}-p_1}{p_1}>\frac{l_{1II}+k_{1II}-k_{1I}}{k_{1I}}$, the capitalist owning the partially worn product (1_I) would obviously find it more advantageous to invest his prices of use continuously accruing to him, in product (1) and not in (1_I). The fulfilment of the equation makes the investment in any two durable or partially worn goods a matter of indifference for the capitalists and is therefore a necessary condition of a stationary state.

From the equation it follows:

$$i_{1I}=i_{1II}=\cdots\cdots i_{1t_1}=i_{2I}=i_{2II}=\cdots\cdots i_{2t_2}=\cdots\cdots i_{yI}=i_{yII}=\cdots\cdots i_{yt_y}.$$

The factor i is the same over the whole field of use of durable instruments. Since the choice is open for the capitalists to invest in intermediate products or in partially worn products, an adjustment must take place of the i prevailing over the field of reproduction of intermediate products and the i prevailing in the field of wear of durable instruments. If they should differ, the capitalists would make additional investments in either intermediate products or durable goods and by that disarrange the stationary process of production and pricing. The same i over the whole field

of the stationary economy, applicable to all capital-goods, makes the investment of his income in any two of them a matter of indifference for the capitalist and is therefore a necessary condition of the stationary state.

We are now in the position to express the price of reproduction of each durable instrument in terms of its prices of use in successive unit-periods with the aid of the factor i and the magnitudes $t_1 \ldots t_y$, indicating the time of durability as a multiple of an arbitrarily chosen unit-period:

$$l_{1\text{I}}+k_{1\text{I}}-p_1=ip_1\ ; \qquad p_1=\frac{l_{1\text{I}}+k_{1\text{I}}}{(1+i)}$$

$$l_{1\text{II}}+k_{1\text{II}}-k_{1\text{I}}=ik_{1\text{I}}\ ; \qquad k_{1\text{I}}=\frac{l_{1\text{III}}+k_{1\text{III}}}{(1+i)}$$

$$\vdots$$

$$l_{1t_1}+0-k_{1(t_1-1)}=ik_{1(t_1-1)}\ ; \qquad k_{1(t_1-1)}=\frac{l_{1t_1}}{(1+i)}$$

$$p_1=\frac{l_{1\text{I}}}{(1+i)}+\frac{l_{1\text{II}}}{(1+i)^2}+\cdots\cdots\frac{l_{1t_1}}{(1+i)^{t_1}}$$

and correspondingly,

(V)
$$p_2=\frac{l_{2\text{I}}}{(1+i)}+\frac{l_{2\text{II}}}{(1+i)^2}+\cdots\cdots\frac{l_{2t_2}}{(1+i)^{t_2}}$$

$$\vdots$$

$$p_y=\frac{l_{y\text{I}}}{(1+i)}+\frac{l_{y\text{II}}}{(1+i)^2}+\cdots\cdots\frac{l_{yt_y}}{(1+i)^{t_y}}$$

Let us here again introduce the special assumption that the prices of use in subsequent unit-periods, hereafter called *successive rates of wear*, are equal for every durable instrument. That means:

$$l_{1\text{I}}=l_{1\text{II}}=\cdots\cdots l_{1t_1}=l_1$$
$$l_{2\text{I}}=l_{2\text{II}}=\cdots\cdots l_{2t_2}=l_2$$
$$\cdots\cdots\cdots\cdots$$
$$l_{y\text{I}}=l_{y\text{II}}=\cdots\cdots l_{yt_y}=l_y$$

$l_1 \ldots . l_y$ are now the prices of use per unit-period of the durable instruments under the assumption that every durable instrument yields the same service in every unit-period of its durability. This enables us to express the relationships stated in equation system (V) in a much simpler way, as follows:

$$\text{(VI)} \qquad \begin{array}{ll} p_1 = l_1 \dfrac{1-(1+i)^{-t_1}}{i}\,; & l_1 = p_1 \dfrac{i}{1-(1+i)^{-t_1}} \\ p_2 = l_2 \dfrac{1-(1+i)^{-t_2}}{i}\,; & l_2 = p_2 \dfrac{i}{1-(1+i)^{-t_2}} \\ \vdots & \vdots \\ p_y = l_y \dfrac{1-(1+i)^{-t_y}}{i}\,; & l_y = p_y \dfrac{i}{1-(1+i)^{-t_y}} \end{array}$$

Here again for all objects, even immediately consumable services, the smallest conceivable durability is one unit-period, because they must be ready for disposition before the act of use. Our formula, then, is generally valid. It expresses, when $t=1$, the general relation between price of use and price of reproduction of intermediate products $p=\dfrac{l}{(1+i)}$. Intermediate products are obviously durable objects with the durability 1. For the other extreme of $t=\infty$, our formula expresses the capitalization of the prices of use for goods of eternal durability $p=\dfrac{l}{i}$. The formulas (V) and (VI) can be applied to all products. The symbols x and n in the previous formulas coincide with the symbol y representing the number of durable instruments. It may be repeated that this simple way of expressing the relationships by equation system (VI) is only possible under special assumptions as to the equality of the successive rates of wear. Dropping this assumption would not, however, mean an alteration of our statements in principle but would only require a more complicated way of expressing them, namely, by replacing system (VI) by system (V).

Our method of deduction seems to have brought a dualism into the treatment of the time element in the pricing-theory. We do not doubt that perhaps it might be possible to deal with the

problem in a different way, dropping from the beginning the distinction between time of production and durability of the priced objects. One would then have to create a broader concept of "time of production" as the number of unit-periods that elapse from the beginning of the process of production until the end of the process of wear. We would then include in this term the time of waiting from the end of production in a narrower sense until the moment of use. Durable instruments would have to be divided up into particles, each particle representing one use for one unit-period and having a time of production different from that of the other uses of the same material instrument, which become due in other unit-periods. The way of representation chosen above seems, however, preferable.

IV

For stating the final equation system, including all the newly deduced relationships, all objects, except the original means of production, must be regarded as produced as well as durable. Their times of production and their durabilities may vary from 1 to any positive number of unit-periods. One part of the produced and durable objects, the produced means of production, must also be placed beside the original means of production, since they are used for production and must, like the latter, be at hand at the beginning of the unit-period under consideration. It is necessary to introduce special designations for them. Let us hereafter designate by

$G_1 \ldots G_n$	the quantities per unit-period	of the consumption goods
$l_1 \ldots l_n$	the prices of use per unit-period	
$p_1 \ldots p_n$	the prices of reproduction	
$z_1 \ldots z_n$	the times of production	
$t_1 \ldots t_n$	the durabilities	
$\Gamma_1 \ldots \Gamma_m$	the quantities per unit-period	of the produced means of production
$\lambda_1 \ldots \lambda_m$	the prices of use per unit-period	
$\pi_1 \ldots \pi_m$	the prices of reproduction	
$\zeta_1 \ldots \zeta_m$	the times of production	
$\tau_1 \ldots \tau_m$	the durabilities	
$R_1 \ldots R_r$	the quantities per unit-period	of the original means of production
$q_1 \ldots q_r$	the prices of use per unit-period	

and as before by

a the technical coefficients (with respective indices; defined as quantities required per unit-period, see section II)

In order to distinguish between the single technical coefficients we put in front of the letter all indices which refer to a produced means of production, whereas we put after the letter all indices which refer to either original means of production or final consumption-goods. For greater simplicity only the first and last members are written in every series which contains a number of members, n, r, or m.

Proceeding exactly as above in the initial systems of equations we first put $(r+m)$ equations, which indicate the dividing up of the means of production among the articles to be produced:

$$
\begin{aligned}
R_1 &= a_{11}z_1G_1 + \cdots\cdots a_{n1}z_nG_n + {}_1a_1\zeta_1\Gamma_1 + \cdots\cdots {}_ma_1\zeta_m\Gamma_m \\
&\vdots \\
&\vdots \\
R_r &= a_{1r}z_1G_1 + \cdots\cdots a_{nr}z_nG_n + {}_1a_r\zeta_1\Gamma_1 + \cdots\cdots {}_ma_r\zeta_m\Gamma_m \\
\Gamma_1 &= {}_1a_1z_1G_1 + \cdots\cdots {}_1a_nz_nG_n + {}_{11}a\zeta_1\Gamma_1 + \cdots\cdots {}_{m1}a\zeta_m\Gamma_m \qquad (1) \\
&\vdots \\
&\vdots \\
\Gamma_m &= {}_ma_1z_1G_1 + \cdots\cdots {}_ma_nz_nG_n + {}_{1m}a\zeta_1\Gamma_1 + \cdots\cdots {}_{mm}a\zeta_m\Gamma_m
\end{aligned}
$$

There are $(m+n)$ cost-equations for the produced articles in the form of system IV:

$$
\begin{aligned}
p_1 \frac{i}{(1+i)^{z_1}-1} &= a_{11}q_1 + \cdots\cdots a_{1r}q_r + {}_1a_1\lambda_1 + \cdots\cdots {}_ma_1\lambda_m \\
&\vdots \\
&\vdots \\
p_n \frac{i}{(1+i)^{z_n}-1} &= a_{n1}q_1 + \cdots\cdots a_{nr}q_r + {}_1a_n\lambda_1 + \cdots\cdots {}_ma_n\lambda_m \\
\pi_1 \frac{i}{(1+i)^{\zeta_1}-1} &= {}_1a_1q_1 + \cdots\cdots {}_1a_rq_r + {}_{11}a\lambda_1 + \cdots\cdots {}_{1m}a\lambda_m \qquad (2) \\
&\vdots \\
&\vdots \\
\pi_m \frac{i}{(1+i)^{\zeta_m}-1} &= {}_ma_1q_1 + \cdots\cdots {}_ma_rq_r + {}_{m1}a\lambda_1 + \cdots\cdots {}_{mm}a\lambda_m .{}^{13}
\end{aligned}
$$

[13] In both systems the technical coefficients ${}_1a_1$ and ${}_ma_1$ appear twice. They indicate the quantity of produced means of production (1) and (m) required for

To establish the final equation system, we need make only the following operations:

1. Multiplying the single equations of system (1) by $q_1 \ldots . q_r, \lambda_1 \ldots . \lambda_m$.

2. Replacing the prices of reproduction $p_1 \ldots . p_n, \pi_1 \ldots . \pi_m$ in system (2) by the prices of use per unit-period according to equation system (VI):

$$l_1 \frac{1-(1+i)^{-t_1}}{i} \ldots . l_n \frac{1-(1+i)^{-t_n}}{i}, \lambda_1 \frac{1-(1+i)^{-\tau_1}}{i} \ldots . \lambda_m \frac{1-(1+i)^{-\tau_m}}{i}$$

3. Multiplying by $G_1 z_1 \ldots . G_n z_n \; \Gamma_1 \zeta_1 \ldots . \Gamma_m \zeta_m$ the single equations of system (2).

So we get finally:

(VII)

$$\begin{array}{l}
R_1 q_1 = a_{11} z_1 G_1 q_1 + \ldots . a_{n1} z_n G_n q_1 + {}_1a_1 \zeta_1 \Gamma_1 q_1 + \ldots . {}_ma_1 \zeta_m \Gamma_m q_1 \\
\qquad\qquad + \qquad\qquad + \qquad\qquad + \\
\vdots \qquad\qquad \vdots \qquad\qquad \vdots \\
R_r q_r = a_{1r} z_1 G_1 q_r + \ldots . a_{nr} z_n G_n q_r + {}_1a_r \zeta_1 \Gamma_1 q_r + \ldots . {}_ma_r \zeta_m \Gamma_m q_r \\
\qquad\qquad + \qquad\qquad + \qquad\qquad + \\
\Gamma_1 \lambda_1 = {}_1a_1 z_1 G_1 \lambda_1 + \ldots . {}_1a_n z_n G_n \lambda_1 + {}_{11}a \zeta_1 \Gamma_1 \lambda_1 + \ldots . {}_{m1}a \zeta_m \Gamma_m \lambda_1 \\
\qquad\qquad + \qquad\qquad + \qquad\qquad + \\
\vdots \qquad\qquad \vdots \qquad\qquad \vdots \\
\Gamma_m \lambda_m = {}_ma_1 z_1 G_1 \lambda_m + \ldots . {}_ma_n z_n G_n \lambda_m + {}_{1m}a \zeta_1 \Gamma_1 \lambda_m + \ldots . {}_{mm}a \zeta_m \Gamma_m \lambda_m \\
\qquad\qquad \| \qquad\qquad \| \qquad\qquad \| \qquad\qquad \| \\
G_1 z_1 l_1 \frac{1-(1+i)^{-t_1}}{(1+i)^{z_1}-1}; \ldots . G_n z_n l_n \frac{1-(1+i)^{-t_n}}{(1+i)^{z_n}-1}; \quad \Gamma_1 \zeta_1 \lambda_1 \frac{1-(1+i)^{-\tau_1}}{(1+i)^{\zeta_1}-1}; \Gamma_m \zeta_m \lambda_m \frac{1-(1+i)^{-\tau_m}}{(1+i)^{\zeta_m}-1}
\end{array}$$

As to the relation of this system (VII) to system (I), we have only to investigate whether it contains the latter for its special assumptions. For this purpose we make all times of production

---

making the unit quantity of consumption-good (1) and also the quantity of original means of production (1) required for making the unit-quantity of produced means of production (1) and (m). Since, however, the law is obvious according to which the single series are composed, we do not, for the sake of simplicity, introduce another distinction of indices.

and all durabilities equal to 1. This does not exactly yield the system (I); the last horizontal line differs in all its members by the factor $\frac{1}{(1+i)}$. The significance of this will be discussed in the course of the following argument.

System (VII) differs from system (I) by the fulfilment of certain conditions which arise in connection with the time element. These conditions can be formulated as follows: It must include among its magnitudes:

1. Only quantities related to a period of time of the same length (unit-period). By "quantities" we mean magnitudes designated in our system of equations by the letters R, G, Γ, and a.

2. Only prices related to such quantities. By "prices" we mean magnitudes designated in our equation system by the letters p, π, l, λ, q. The p's and π's had to be excluded from the equations, because they do not satisfy this condition. They had to be replaced by the l's and λ's.

3. Produced means of production priced at two different moments. System (I) can be interpreted to include produced means of production among the R's or among the S's but not among both of them. In system (VII) the Γ's appear with the R's at the beginning of the period and with the G's at the end in exactly the same quantities.

4. All prices related to the same instant. Apart from the quantities to which they refer, prices themselves can never be related to any period of time but are always paid at one single instant. In any system which includes prices, they must all be related to *the same* instant.

In system (I), if it is interpreted as valid for any period of time, however small, the q's and the p's refer to two different moments —the q's to the beginning and the p's to the end of this period. In system (VII), however, the q's and l's and λ's all refer to the beginning of the unit-period. That can be proved only by a careful examination of how we established it. The non-fulfilment of this condition in system (I) is the reason for the difference between the two systems even if all time magnitudes in system (VII) are assumed to equal 1. Under these assumptions we get, for instance for the produced means of production *at the end* of the unit-period under consideration,

$$\Gamma_1 \frac{\lambda_1}{(1+i)} \cdot \cdot \cdot \cdot \Gamma_m \frac{\lambda_m}{(1+i)} .$$

The first vertical column contains the produced means of production *at the beginning* of the unit-period. It reads:

$$\Gamma_1\lambda_1 \cdot \cdot \cdot \cdot \Gamma_m\lambda_m .$$

The quantities $\Gamma_1 \ldots . \Gamma_m$ are equal with regard to all characteristics of relevance except their temporal characteristics. Hence the difference in price. To divide by $(1+i)$ obviously discounts the value of the end-quantities. The non-fulfilment of the four conditions is the reason that the proceedings per unit-period of a stationary and continuous process of production can never be adequately represented by system (I). System (VII), however, is applicable as far as we can see.

V

In system (VII) the time magnitudes and the factor i appear as entirely new magnitudes. They stand on a par with the magnitudes previously contained in the system (I); i.e., none of them can be regarded as given: *they are all interdependent* and can only be simultaneously explained from the complex of data determining the system as a whole.

If we now define the rate of interest in a stationary state as the part of the value of the capitalists' stock of capital-goods, which they can earn as a stationary income per unit period by offering the services of their capital-goods and continuously reproducing them, it is obviously represented by our factor i. Acts of borrowing and lending money are not necessarily met with in a stationary process of production and pricing, but their occurrence is conceivable. Let us imagine capitalists having to invest from unit-period to unit-period so small a capital that they cannot get any unit of capital-goods. They then will have to transfer their capital to another capitalist, stipulating for themselves the right to a part of the income of the final capital-good, the quota being proportionate to their own contribution. There is nothing to prevent contracts of this kind from assuming the form of an act of borrowing and lending money under stipulation of interest. To make

these acts fit into a stationary process of production and pricing, the interest stipulated in them must be proportionate to the factor i in our equation system, and to the time for which the sum of money is lent or borrowed, measured as a multiple of the unit-period. The factor i, therefore, is a true measure of the rate of interest in a stationary state. The final equation system (VII) allows us to read off the relationships existing between time of production, durability, and the rate of interest in a stationary state.

The time magnitudes occupy a position similar to that of the technical coefficients. They are, like the technical coefficients, functionally dependent on the pricing-process as a whole and in the same way subject to the principle of substitution. The entrepreneur, trying to determine the optimum method of production, not only has the choice between different combinations of original or produced means of production, but he has also to decide upon the optimum length of the production period and the optimum durability to be given to the products, although within limits. The limits are determined by the technical possibilities and the technical knowledge of the entrepreneur, as in the case of the technical coefficients. But if there are several ways open to the entrepreneur for regulating time of production and durability, it is on the prices of all the means of production, the price of the product, and the rate of interest that the optimum time of production and the optimum durability depend.

We may express this dependence by two systems of equations, in which the time magnitudes are represented as functions of the whole pricing-process:

$$\begin{aligned} z_1 &= fz_1(q_1 \cdots q_r, \lambda_1 \cdots \lambda_m, l_1, i) \\ &\vdots \\ z_n &= fz_n(q_1 \cdots q_r, \lambda_1 \cdots \lambda_m, l_n, i) \end{aligned}$$

(VIII)

$$\begin{aligned} \zeta_1 &= f\zeta_1(q_1 \cdots q_r, \lambda_1 \cdots \lambda_m, i) \\ &\vdots \\ \zeta_m &= f\zeta_m(q_1 \cdots q_r, \lambda_1 \cdots \lambda_m, i) \end{aligned}$$

and

$$
\begin{aligned}
t_1 &= ft_1(q_1 \ldots . q_r, \lambda_1 \ldots . \lambda_m, l_1, i) \\
&\vdots \\
t_n &= ft_n(q_1 \ldots . q_r, \lambda_1 \ldots . \lambda_m, l_n, i) \\
\tau_1 &= f\tau_1(q_1 \ldots . q_r, \lambda_1 \ldots . \lambda_m, i) \\
&\vdots \\
\tau_m &= f\tau_m(q_1 \ldots . q_r, \lambda_1 \ldots . \lambda_m, i)
\end{aligned}
\qquad \text{(IX)}
$$

About the form of these functions, a general statement can only be made under the assumption that all entrepreneurs always know and always apply the cheapest available method of production. Supposing, then, the possibility of a continuous or discontinuous substitution of several methods of production in the same productive process, time of production and durability show a dependence on the factor i and the other prices of the means of production as follows:

The higher the value of "i," other prices being equal, the shorter the optimum time of production, and vice versa.[14] The longer the time of production in any productive process, the more the quantities of the original and produced means of production required per unit-period may decrease. Under the purely technical aspect, the productivity of every productive process can be regarded as increasing with its roundaboutness. With any increase in its roundaboutness, however, the longer the intermediate products of the early stages of production remain in the productive process. A greater amount of capital is invested in the intermediate products and withheld from other income-earning use. Hence, the longer the period of production the heavier are the losses resulting from confining capital in the productive process and lengthening its circulation period. The optimum method of production occurs where the gains from an increase in technical productivity at a given and constant system of other prices are exactly counterbalanced by the losses from lengthening the circulation period of the capital invested. The optimum method of production thus is func-

[14] For a mathematical elaboration, see I. Fisher, *The Rate of Interest* (New York, 1907), Appendix to chap. iv, §§ 2 and 3.

tionally dependent on the prices of the means of production and the rate of interest.

The case is similar with regard to the durability of the products. *The higher the value of "i," other prices being equal, the shorter the optimum durability, and vice versa.*[15] The entrepreneur cannot determine whether a longer or shorter durability is the optimum unless the prices of the means of production and the rate of interest are known. First of all, the investing entrepreneur has to take into consideration the fact that, the more durably the capital instruments are constructed, the greater is the increase in the quantities of original and produced means of production required *for one reproduction*, and, on the other hand, that the more the period of durability is shortened, the more often reproduction of the capital instrument is required, although the quantities of means of production required for one reproduction may decrease. Taking only these means of production into consideration, the optimum method of production is obviously that which requires least means of production *per unit-period in the long run*. In addition, however, the capital invested in the first case is repaid further in the future, and its circulation period is lengthened; in the latter case, it is repaid sooner and the circulation period of the capital invested is shortened. If the factor i is positive, a lengthening of the circulation period adds to the cost of production for the investing capitalist in the same way as increased quantities of original and produced means of production. The test of the optimum method, then, is no longer that the quantity of original and produced means of production, required per unit of product, averaged according to their prices, be a minimum, but that this quantity, *plus the cost of time per unit of output for which the capital invested is withdrawn from income earning*, be a minimum. What change in the period of investment is counterbalanced by an increase or decrease in the quantities of means of production, and vice versa, cannot be determined independently of the relative

[15] For the most detailed elaboration of the relationships, see Gustaf Akerman, *Realkapital und Kapitalzins*, dissertation, Stockholm, 1923 (in German), mainly pp. 88 ff., 139 ff. Cf. also I. Fisher, *op. cit.*, mainly p. 196: "Again it is evident that a choice of the more durable instruments, as compared with those less durable, will be favored by a low rate of interest, and a choice of short-lived instruments will be favored by a high rate of interest." Some examples of this are given. Cf. also, pp. 290, 306. Cf. also, Cassel, *op. cit.*, Book II chap. vi.

magnitude of the prices of the means of production and the factor i.

The form of the functions expressed in equation systems (VIII) and (IX) is such that the optimum time of production and the optimum durability decrease as i increases; i.e., *the social amount of capital contracts*. A method of production becomes optimum, which, when compared with the previous one, requires perhaps more means of production but less time. It pays to give less durability to the durable instruments, even if the quantity of means of production required per unit-period for a continuous reproduction in the long run somewhat increases.

If, however, i is assumed to decrease, the optimum time of production and the optimum durability increase; i.e., *the social amount of capital spreads*. A method of production becomes profitable which, when compared with the previous one, requires less means of production but more time. The durable instruments may be constructed for a longer period, if by so doing the aggregate quantity of means of production required per unit-period for a continuous reproduction can be somewhat lessened.

The lower the rate of interest, other things being equal, the more time can be substituted for the other means of production, and vice versa. The quantitative relationships are entirely governed by data which we may regard as determining the form of our functions in equation system (VIII) and (IX).

SUPPLEMENTARY NOTE

The limitation of his representation to timeless production is acknowledged by Walras:[16] "La production exige un certain délai. Nous resoudrons cette seconde difficulté en faisant ici purement et simplement abstraction de ce délai"; and: "Nous resoudrons la seconde difficulté relative au délai nécessaire pour la production; ... en supposant cette production instantanée."[17] An investigation into the modifications of the pricing-analysis due to the dropping of this assumption is, therefore, a development of the Walrasian theory. He himself makes no successful attempt to develop his theory in this direction.

This defect of the Walras-Pareto school and its analysis has been mainly recognized by Wicksell:[18]

[16] *Op. cit.* (4th ed.), p. 215. [17] *Ibid.*, p. 260.

[18] *Vorlesungen über Nationalökonomie auf Grundlage des Marginalprincips* (Jena, 1913), I, 237–38.

Die Bedeutung des Zeitmoments für die Produktion ist von Walras und seiner Schule noch nicht auf den richtigen Platz gestellt worden. Der Begriff Produktionsperiode und Kapitalinvestierungszeit existiert, wie wir bereits betont haben, für die Walras-Paretosche Theorie nicht, das Kapital und der Kapitalzins erhalten in ihr ganz dieselbe Stellung wie der Boden und die Grundrente, mit anderen Worten: diese Lehre bildet fortgesetzt eine Theorie der *kapitallosen*, wenn auch mit allerlei als unzerstörbar betrachteten technischen Hilfsmitteln ausgerüsteten Produktion.

Wicksell, himself, gives a representation that in its main arguments seems to be in conformity with the opinions given in this article. Wicksell takes up the arguments of Jevons and Böhm-Bawerk that the period of production bears a relationship to the rate of interest, puts on the same level the period of investment, and derives a similar relationship between the rate of interest and the latter. The scope of the present paper does not permit a more detailed analysis of the views of the three writers or even a discussion of the differences between their analysis and our own.

Cassel does not acknowledge the limitation of the equation system (I) to the case of timeless production. He says:

As to the significance of the technical coefficients we need make only the following observation: The making of a unit-quantity of a finished article requires, as a rule, the use of means of production of a whole series of different unit periods. Production is only completed in the last of these and the finished article made available for consumption. Our "a" designate primarily the total quantity of the means of production of each particular kind, which are required in this way for making the unit quantity of a finished article. They are as such sums of quantities of means of production of various unit periods. In the stationary economy however production goes on to an invariable extent. Hence the making of an article of a certain sort is repeated in each unit period. In order that this continuous process of production shall give the unit quantity of the article, in each unit period, a definite quantity of the means of production must be available in each such period. The demands which the constantly repeated product of the finished article makes upon the means of production of a definite unit period, are summed up, and determine this quantity. It is, therefore, obviously the same as the quantity of the means of production of different unit periods, which is required for making a definite unit quantity of the article. Our "a" thus designate the quantities of the means of production defined in both the first and the second way."

The question whether the equation system holds true in this sense depends upon whether Cassel's productive factor "capital-disposal" is meant to fit in with this exact explanation as one of the means of production, R, beside the original means of production.

This would mean an essential difference from the explanation of both Walras and Pareto. The latter include only capital-*instruments* among the means of production. Even if we interpret Cassel in this way, other difficulties arise.

" *Op. cit.* p. 139.

The quantity of capital-disposal required for the unit of any product equals the value embodied in the intermediate products of a time-taking process of production multiplied by the time which these intermediate products remain in the process of production. The value of intermediate products consists of sums of *other* technical coefficients multiplied by their respective prices. The technical coefficient for *capital-disposal* thus, is a product of a value quantity and a time magnitude; the value quantity of which coincides with the value side of the other technical coefficients of the same product, the time magnitude being the only magnitude thus introduced into the system.

The total amount of capital-disposal of the whole economy equals the sum of all single technical coefficients of capital-disposal times outputs. The total amount of capital-disposal, therefore, is again a product of a value quantity and a time magnitude. Its value factor is obviously the amount of capital-disposal *available per unit of time.*

For establishing equation system (I) which is meant to be valid with reference to a unit of time, we must know the amount of capital-disposal available per unit-period. Assuming the total amount of capital-disposal in the economy concerned as a given quantity, as an original means of production, does not tell us anything about the quantity of capital-disposal available per unit of time. The very notion of capital-disposal, unlike any other means of production, contains in itself a time dimension. Unless we know over what period it is actually spread, we cannot know anything about its value dimension. It is, therefore, not enough to know the product; we must know the two factors of which it is composed, namely, value and time. It would be impossible to assume as constant and given the proportion in which the time dimension and the value dimension contribute to bringing about the total amount of capital-disposal in the economy concerned. For even assuming the *total amount* of capital-disposal to be given, the *relative magnitudes* of its time factor and its value factor vary in a functional dependence of the whole pricing-system, as we have attempted to prove. If for instance, as we have shown the social amount of capital contracts and spreads in functional dependence on the rate of interest, the relation between the value dimension and the time dimension of the social amount of capital is affected.

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TRANSPORT CO-ORDINATION: MEANING AND PURPOSE

IN THE study of transportation emphasis has recently shifted somewhat from the examination of particular agencies, especially the railway, to a consideration of the relation of one agency to another. Explanation of this change lies in the disconcerting invasion by new facilities of the sphere of inland transport, shared comfortably for many years by steam and electric railways and horse-drawn vehicles. Outstanding among the invaders has been the motor vehicle; and the airplane and dirigible have lately induced concern, if not by their achievements, at least through vaguely disclosed possibilities. The transcontinental railways have lost traffic to coastwise vessels operating through the Panama Canal; and the recrudescence of internal waterways has also threatened transport equilibrium. In number and character these developments are spectacular; and they have been welcomed heartily by the public for the enrichment of transport service which they bring; yet almost equally do they draw attention because of readjustments which they necessitate. The disturbance of old relations creates an impression of chaos, felt most keenly by existing transport interests but shared by others, and the need is everywhere stressed of welding discordant elements into a system. As if by common action the word co-ordination has been applied quite generally to the solution thus suggested, and in many minds has passed from the mark of a vague purpose into the name of a theory and a program, with considerable definiteness tacitly assumed. Thus we read: "The fundamental economic principle governing the relation between railway and highway transportation should be co-ordination."[1] "Co-ordination is the ultimate, logical answer to the transportation mix-up we are up against."[2] "The term 'co-

[1] William T. Lyle, professor of civil engineering, Washington and Lee University, discussing by letter an address by Ralph Budd before the American Society of Civil Engineers, Kansas City, April 14, 1926.

[2] R. H. Newcomb of the New Haven Railroad before the New England Motor Transport Conference, Boston, December 8 and 9, 1924.

ordinated transport' is one which has come to have a definite and specific, almost a technical meaning."[3] Through its association with various salutary suggestions the word has acquired a strong appeal among persons concerned with transport matters, and with the potency that shibboleths obtain, seems able to prepossess men in favor of proposals that bear its label. But unfortunately, in its specific applications, co-ordination lacks the unity of meaning its users assume; and general acceptance of the vague "principle" accordingly tempts special interests to employ it to denominate programs which clearly are open to debate. There is practical, as well as academic value, consequently, in distinguishing the several senses of the term and considering what they imply.[4]

In a recent book bearing the title, *Transport Coordination* we are told that any policy concerned with the elimination of wasteful competition constitutes co-ordination; in it we read also that a "differentiation in function" between the several agencies provides the basis of co-ordination; and, further, that co-ordination is complete when one agency controls the others.[5] At a New England conference concerned with motor transportation the difficulties in that area were generally believed to find their remedy in co-ordination, one speaker meaning that busses should be run by railways, another that independent truckers should assume all short-haul, less-than-carload business, another that the passenger schedules of diverse agencies should be mutually adjusted, another that public regulation should restrict bus services that parallel necessitous rail lines, another that regulation should be "judicious" and recognize "the right of the public to select

[3] George D. Ogden, assistant vice-president, Pennsylvania Railroad, in lecture at Rutgers University. Abstract in *Railway Age*, Motor Transport Section, April 26, 1930.

[4] The Interstate Commerce Commission has recently ordered a second investigation of motor transport, to be concerned especially with "the general matter of co-ordination." See *Railway Age*, May 24, 1930, pp. 1248 ff.

[5] K. G. Fenelon, London, 1929, Ch. 5. Since the present article was written there has appeared another book on the subject of co-ordination, *Coordinated Motor-Rail-Steamship Transportation* (1930), by G. Lloyd Wilson. It is chiefly devoted to describing what are here called joint services, though the first and last chapters contain a number of general remarks on the subject.

within reasonable limits the type of service which it desires."[6] While these views are not wholly inconsistent, they differ considerably in outlook and purpose. Thus co-ordination is taken by some to mean a condition, by others to mean a method. To the former any method is appropriate that achieves the condition; to the latter any condition is acceptable which results from the method. If the condition desired is that each transport function be performed by the agency which can perform it best, it is the opinion of many persons that one very effective method is to allow the public to choose among rival agencies under equal competitive conditions. But others, while observing that this problem of economic differentiation exists, see in the competition just suggested as a means, the main evil to be cured. Those who look upon the avoidance of competition as the prime objective commonly favor, as a method, the control of one agency by another; and this idea of unified control, often without reference to any particular end, has come to constitute the essence of co-ordination to many who use the term. Thus in the United States the co-ordination of rail and motor transport usually means the operation by railroads of trucks and busses, directly or through subsidiaries. This usage is not impeded by the fact that, literally, co-ordination is a relation between equals, and subordination would here be a more appropriate term. Perhaps the looser meaning of "harmonious adjustment" can be stretched to cover all cases, at least if agreement is reached as to the point of view from which harmony shall be judged—that of the older means of transport with their vested interests, that of the newer means with their ambitions, or that of the public which buys transportation.

Transport agencies may be in complementary relation, as that of two railways joined end to end, or in alternative relation, as that of two parallel railways. In the latter case the relation, further, may be co-operative or competitive. Co-operation may be partial or complete; if complete, monopoly exists. These classes of relationship are not mutually exclusive, since, for ex-

[6] *Report of Proceedings, New England Motor Transportation Conference, Boston, December 8 and 9, 1924.* Issued by National Automobile Chamber of Commerce.

ample, a bus line and a railway may be rivals for some traffic, and may complement each other through joint services in handling other traffic. It is in connection not with one, but with all of these inter-carrier relations that difficulties have arisen through the emergence of new transport agencies. The problems thus created fall into three groups. In the first place, it is inevitable that, with the advent of new transport facilities of genuine utility, the spheres of the older agencies should contract somewhat, and it is necessary in the public interest to facilitate, by private experiment and governmental supervision, the process of determining for the several agencies their appropriate fields of activity. It is found, secondly, that in many instances traffic can be handled most effectively through the creation of joint services involving the integrated use of more than one facility; and it is desirable, again, by public or private means, to promote their development. In the third place, the paralleling of older by newer agencies may in some cases provide an excess of capacity so wasteful, or so subversive of the continued stability of some established and altogether essential facility, that the mitigation of competition itself constitutes a problem. All of these situations are commonly recognized, but not clearly distinguished, and the solution of them all is believed commonly to lie in the magic of co-ordination. But while they all have elements in common, and a given concrete case may involve more than one of these problems, the principal objectives contemplated in their statement are quite distinct; and a method of co-ordination approved from the standpoint of one of them, may be viewed askance with reference to another. This statement requires elaboration, and the following paragraphs are devoted to that purpose.

DIFFERENTIATION IN FUNCTION

While suitability for unlike functions may be conceived by some to provide the economic basis of co-ordination, and while the assignment to each agency of its appropriate place in the transportation scheme may be heralded by advocates of co-ordination as their ultimate ideal, this broad aspect of inter-carrier relationships seldom concerns them directly. Such an object

involves primarily an adjustment of transport methods to the public need, rather than to each other, and therefore derives otherwise than from those irritating contacts of rival agencies, or imperfect adjustments of complementary agencies, which create the immediate problem. Practical attempts at what is called co-ordination are made mainly by persons interested in particular transport undertakings, and their main concern is with the retention or acquisition of traffic, rather than the impartial allocation of it among agencies. Lip service paid the latter ideal is commonly moved by the former purpose. Railways which contend, often with reason, that traffic which properly belongs on the rails moves by road, would usually welcome that traffic back just as warmly, provided it would yield a profit, even if truck or bus were the more efficient means of carriage.

The question of determining which agency is best under given circumstances has arisen most critically as a result of motor-vehicle development. In the field of inter-city passenger transport the bus is a formidable rival of the railway, chiefly in the shorter distances but increasingly on longer runs. The truck has taken over a considerable part of the short-distance movement of small consignments, but the limits of its economical employment in inter-city service await determination. In urban transport the division of function between bus and electric railway is undergoing experimentation, and the wagon still provides an alternative, though one of waning importance, to the truck. In the opening of new territory, as in Africa and Australia, the motor vehicle makes possible a choice of means of transport which was not available a few decades ago. Almost equal to the motor vehicle, if not in importance, at least in its provocation to controversy, is the renewal of internal waterway improvement, and particularly of agitation for extensive schemes such as the proposed Lakes-to-the-Atlantic seaway. The airplane also provides an alternative to the high-class passenger, mail, and express services of the railway, and in some instances of the steamship, and there is a prospect of trans-Atlantic dirigible operation. Where more than one agency is available for the performance of a transport function, the choice made will depend upon the influ-

ence of three factors: the incidence of public patronage, the pressure exerted by legislative and regulative bodies, and the financial control possessed by one agency over another.

It is commonly implied that the natural way to assign the various agencies to their rightful places is to have a single organization controlling all facilities in a given area. Then, it is urged, an intelligent management will determine with minimum waste what arrangement is most economical. This could mean state monopoly, but in the United States usually railway control is meant. Quite the opposite is the view that we should apply to transportation the same guidance which governs other lines of production; namely, that buyers should be free to choose the product or service they prefer, and by their choice dictate the development of one alternative or another. So varied are the manifestations of this problem that flat acceptance of either of these courses is unwise. Where the use of one agency is an integral part of the service performed by another, as when railways employ motor trucks for interline transfers in terminal areas, or on line hauls in lieu of way freight trains, choice of method by the dominant agency is as desirable as it is inevitable. And when neither of two agencies has yet been introduced into an area which can support only one, the opportunity for a free choice by buyers of transport service is absent, and monopoly by a competent organization uncommitted to any single method of transport will promote economy. This is the sort of situation in which the South African Government Railway is finding it advantageous to use motor vehicles in establishing new branches. But where a developed area is already served by one facility, but will be better served if a new facility now potentially available is introduced, it is an altogether different question whether the latter should be placed under the wing of the former. For quite probably the already existing means of transport, with its large investment, would be governed chiefly by the desire to retain traffic rather than to exploit most fully the possibilities of the new agency. The control which American railways have exercised over internal and coastwise water transportation has not always—and some would say has never—operated to give the

latter such a place as an impartial allocation of functions would establish for them. The Panama Canal Act, in divesting railways of their interest in competing water carriers, is an official expression of this view. Recent opposition in Great Britain to the grant of authority to railways to operate independent road services was based largely on the fear that the railways would use their financial power to destroy non-railway operators, and would thereafter raise the rates charged for motor services so as to curtail its usefulness. The attitude in the United States toward this problem is indicated below.

But if choice between rival methods of transport is to be left to the verdict of public patronage, it is essential that the conditions of competition be fair and equal. Road vehicles must bear the full cost, but no more than the reasonably imputable cost, of the highway services which they employ; and they should be required to assume fully the responsibilities which they undertake as public carriers. And if, as is probably often the case, the railways handle small consignments at less than remunerative rates, the subsidy which such shipments receive from other traffic that pays adequate charges is not in the interest of an economic division of function. Uncontrolled competition of railways and internal waterways inevitably denies the latter a fair opportunity to develop, both because railways are disposed to cut rates drastically on parallel services and compensate elsewhere for such reductions, and because waterways are seldom able to render a complete service alone, but require the co-operation of the railways in the establishment of joint services. It has been necessary through legislation to restrict such rate cutting, and to compel the railways to provide the necessary physical connections with water carriers and to arrange for through rates and an equitable division of rates. But granting that such provision has been made, the requirements of equal competition are violated even more seriously if water-borne traffic is relieved by the public of the substantial cost of the waterway itself. These instances indicate that it is often necessary by public action to guard carefully the conditions requisite for an economic choice of transport service. Such control must be part of the plan of those who view co-

ordination as a wise allocation of functions among agencies, and who find unification distasteful. Other persons, who conceive co-ordination mainly in terms of joint services or curtailed competition, may regard the competitive test of superiority as shamefully wasteful. The ends they seek may possibly be more significant, but to the achievement of them may not properly be ascribed the incidental virtue that the most economical distribution of transport functions among agencies will thereby necessarily result.

DEVELOPING JOINT SERVICES

Before considering co-ordination as a remedy for wasteful duplication, it is convenient to examine its meaning in relation to the joint services of complementary agencies. Transport co-ordination in this sense is found in its simplest form in the use of road vehicles to convey traffic to and from railway stations. It is exemplified in all arrangements for the through movement of traffic by road and rail, rail and water, rail and air, and so on. It is present in the degree that means are present for effective joint services. While this conception of co-ordination is quite distinct from the one just discussed, it is often the case that the creation by complementary agencies of a new joint service provides a new competitor for existing services, and expands the public's range of choice. The British railways, in seeking "road powers" in 1928, contended that the operation by them of bus lines with good rail connections would induce many people to transfer to the rails at junction points, whereas otherwise they would complete their journey by bus. Doubtless the agreement leading to the present transcontinental air-rail service, whereby passengers occupy airplanes by day and Pullmans by night, was similarly motivated. The air lines expected to get traffic that would prefer the train to a through journey by air; while the railways hoped to hold traffic that would prefer a transcontinental plane ride to the much slower journey by railway alone. To the extent, moreover, that there is some variability in the proportion of a joint service which each agency will provide, this problem is again related to the former one of suitably allocating functions among

agencies. Apparently transportation people view that problem chiefly in this restricted way.

The minimum requirement for co-ordination in the present sense is the provision of a place of transfer. The better provided such a place of transfer is with expediting and cost-reducing facilities—the better designed and equipped are the freight house and yard, the wharf, and the landing field—the higher the degree of co-ordination. An example of improvement in this connection is the change in design of railway passenger stations to improve the service of taxicabs. With co-ordination in space goes co-ordination in time. A feeder bus line must have a schedule planned with reference to that of the railway which is fed. A suitable adjustment of train arrivals to steamship departures may require the operation of special boat trains. But co-ordination reaches a higher point when, by the provision of through routes, tickets, checking, and billing, the passenger and the shipper or his agent are relieved of the work of transfer, and when standardization permits the interchange of cars and containers to reduce handling. The co-operation of complementary services, though not of dissimilar agencies, is well illustrated by the activity of the Railway Clearing House in Great Britain, the International Car Union of Europe, and the Car Service Division of the American Railway Association. Provisions made for the through movement of traffic by diverse agencies may be primarily intended to improve service, but the effecting of economies is often an important object. This is the case when the local collection and delivery of goods moving by rail is conducted by the railway in such a way as to reduce the freight house and yard space required, and the waiting time of road vehicles desiring to load and unload. Some times the co-ordinated service may include not only transportation, but also certain closely related merchandising functions. Thus the system of railhead distribution in Great Britain involves the integration with rail and road services of the provision of storage space and clerical help, for the assistance of wholesalers.

The consecutive employment of unlike transport facilities in handling given traffic may be organized in a variety of ways.

The arrangement may be wholly spontaneous, as when a railway provides a platform and a farmer drives to it and unloads his produce on to it. Some negotiation between the different agencies may be necessary before an understanding is reached or a contract signed which will bring about the desired co-operative action. In this way the present transcontinental air-rail services have been effected by agreement between railways and air lines. Where independent carriers will not voluntarily unite in the provision of desirable joint services, a public-service commission may compel such routing and scheduling and such arrangement of through routes and rates, as will meet the public need. This may be done where bus and rail lines do not satisfactorily co-operate. If regulative changes were inaugurated so that the establishment of through services and rate divisions by rail and motor carriers were facilitated, instead of impeded as at present, co-ordination in the present sense would be promoted. As stated above, the establishment of joint services by railways and internal waterways commonly requires some compulsion of the former, and close supervision of rate divisions in the interest of the latter. In the case of road-rail services, the position of the railway is likely to be dominant, either because of its financial preponderance or because motor vehicles provide only a minor ingredient in the joint service. Such dominance tends to assume corporate form, either through the acquisition of stock in established motor carriers, as is coming to be general in the case of British bus lines, or through the creation of motor subsidiaries, such as the New England Transportation Company of the New Haven Railroad. To some extent, but less commonly, trucks and busses are operated directly by railway companies.

In the creation of well-arranged complementary services it is sometimes the case that nothing short of complete domination of one agency by the other will prove effective, but control of this kind is not necessarily implicit in the end sought. The co-operation of independent carriers may be equally effective, either brought about quite voluntarily, or under the guidance of public authority. Such independence, together with such public direction, may even be thought essential to the existence of joint serv-

ices, as in the case of internal waterways. The unification of carriers, moreover, where unified control seems essential to any satisfactory complementary arrangement, differs in purpose and effect from combination of a monopolistic nature. This distinction, an obvious one, was recognized in the Transportation Act of 1920 in the provision for railway consolidation, with the condition that competition be maintained. Through its subsidiary, the New York, New Haven, and Hartford Railroad has established an extensive network of auxiliary motor services; but the paralleling of those joint motor-rail services by independent motor carriers does not render them less complete examples of co-ordination in the sense here under discussion. In this sense, co-ordination is complete in the degree that complementary agencies are effectively adjusted to each other. The degree of unification of control and of elimination of competition is irrelevant. The undeniable interest of the public in good joint services may not properly be invoked to aid the promotion of co-ordination in these other possible senses.[7]

CO-ORDINATION TO REDUCE COMPETITION

This topic brings us back to a consideration of alternative agencies, but with reference, not to the matter of making a right choice between them, but rather to that more adequately appreciated problem of escaping the consequences of excessive duplication of facilities. This wording, at least, describes the problem from the public standpoint; from that of established carriers, the objective is simply the mitigation of competition, whether undesirable socially or not. It should be no secret that the praise of co-ordination by transportation people is very often but the euphemistic anathematizing of competition. But used in this connection the term stretches the limits of even the broadest definition. For if facilities are excessive they should be reduced,

[7] When railways operate motor vehicles or airplanes to accomplish one purpose, it may often be natural to extend such operations where, not this purpose, but some other is served by them. The writer is aware that the means for accomplishing different ends may not be separated with the same logical sharpness as the ends themselves; but this is more reason, rather than less, for keeping the ends themselves distinctly in mind.

and elimination, at least to the affected instrumentality, is not equivalent to harmonious adjustment.

But it is necessary, first of all, to insist that rivalry among agencies actually prevails, for a faith exists in some quarters that competition may be exorcised by denying its existence. Such an attitude has been rationalized by one eminent spokesman by saying that the several agencies are non-competitive for the reason that each agency takes only such traffic as it can handle better than the others—an interesting conception according to which it would be incorrect to say that the stage-coach suffered from the competition of the railway. The basis of such reasoning is the truly fortunate circumstance that each agency has its points of superiority, and that each is well suited for certain types of traffic which do not appeal particularly to the others. But so providential a differentiation of function as is often assumed does not exist; and each agency draws traffic which, in the absence of that agency, could be handled at profitable rates by one or more other agencies. Passengers may travel between New York and Boston by bus, railway, and airplane, at fares which approximate $4.00, $8.00 and $16.00, respectively, and at speeds exhibiting a reversal of that relationship; that is, roughly, four, two, and one. These services are sharply distinguishable in cost and quickness; and each appeals in some measure to traffic which, in its absence, would not seek the others. But a great deal of the traffic of each agency would go by one of the others if it were not available, and such traffic is regarded covetously by all. From the fact, therefore, that different agencies provide unlike services, it must not be concluded that competition does not exist. The several services are related, in part, as alternatives, and it is this condition that is described by the much-used phrase, duplication of facilities.

In current writing such duplication is seldom alluded to without the injection of the adjective "wasteful." While the situation so described involves the presence together of dissimilar transport facilities, the judgment that duplication is wasteful derives no doubt from the common view of one particular transport facility, the railway, that it is naturally monopolistic. But while

thorough-going competition is less likely to prove satisfactory in transportation than in manufacturing, merchandising, and agriculture, this assumed wastefulness calls for a number of qualifying observations. The condition during most of their history of the majority of American railways has made it appear entirely normal for capacity to be under-utilized, and for its enlargement to involve serious waste. But when growing traffic requires an expansion of facilities—and such expansion, as apart from mere extension, is now common in rail transport—duplication has an altered significance. Contrary to earlier assumptions as to the fixity of railway costs, it now appears that, beyond the early stage of traffic development, growth of business is accompanied by a nearly proportionate increase in the total cost of providing rail service.[8] If that is so, then in a growing community duplication is wasteful in only a temporary sense. Moreover, when we turn to motor and air transport, we find these agencies almost wholly lacking in the characteristics which have made rail competition wasteful, for the unit of growth of the transport undertaking is the vehicle and not the roadway.[9] But this is a minor consideration in the present connection, for the wastefulness of inter-carrier competition is usually stressed from the railway angle. Nevertheless, the phrase "natural monopoly" is an overstatement as applied to railways, and much more of an overstatement as applied to transportation in general, and the existing disposition on the part of persons interested in questions of inter-carrier adjustment to assume the contrary, deserves accordingly to be criticized.[10] A corresponding tendency exists to exaggerate the acceptance of the theory of regulated monopoly in public policy toward transportation in the United States. The consolidation and pooling sections of the Act of 1920, with their

[8] See J. M. Clark, *Economics of Overhead Costs*, chaps. xiii and xiv, and M. O. Lorenz, "Commodity Values and Freight Rates," *Railway Age*, March 22, 1930, especially n. 2, p. 691.

[9] Discussed by the writer in the *Quarterly Journal of Economics*, August, 1929.

[10] As stated by Professor Winthrop M. Daniels: "The more intimate one's acquaintance with the transportation industry, the more thoroughly is one imbued with the persistent, pervasive, inescapable and dominant rôle played by competition." *American Economic Review Supplement*, March, 1924, pp. 46–47.

explicit requirement that competition be preserved, probably reflect quite accurately the prevailing judgment on this matter. State commissions are prone to grant exclusive certificates to bus and truck lines, but the monopolistic tone of this policy is mitigated by the dominance of private vehicles. And there is little disposition, outside of a few states, to restrict motor-carrier operations greatly because they parallel rail lines. It seems likely, moreover, that when legislation is enacted for the regulation of interstate busses, definite provision will be made for the preservation of competition with the railways.[11] Those who mean by co-ordination a marked curtailment of competition, and at the same time speak of co-ordination as an accepted policy, are probably governed by their wishes in the matter.

But the issue is not thus disposed of. The problem of inter-carrier competition appears most strikingly in those instances, which are fairly numerous, where one facility, commonly a railway, is indispensable to the communities served, and where the traffic is so meager that the diversion of any part of it will mean a serious weakening of the essential facility and perhaps necessitate its abandonment or its subsidization through inclusion in

[11] At the present writing, final action has not been taken by Congress. The legislative history of the present bill, as it bears on inter-carrier competition, is reported in the *Railway Age*, Motor Transport Section, April 26, 1930, as follows: ". . . . a proviso was then inserted that the provisions of the transportation act are not to be construed as giving any preference to rail or water transportation over motor vehicle transportation. It was also provided that no rate shall be held to be unjust or unreasonable 'on the ground that it is unjust to a competing carrier engaged in a different kind of transportation.'

"The House adopted an amendment directing the commission to give consideration to another applicant for a certificate whenever the only existing service on a given route is furnished by a company connected with a railway and the Senate committee went a step farther by adopting a substitute amendment providing that absence of motor vehicle service or of actual competition on any route shall be considered sufficient evidence that public convenience and necessity will be served by the granting of a certificate. As a final step the committee adopted another amendment, to the section which authorizes the Interstate Commerce Commission to approve consolidations, prohibiting a consolidation or acquisition of control involving motor vehicle carrier where one or more of the parties is engaged, directly or indirectly in the transportation of persons by railroad. It is understood that in the Senate an effort will be made to require railways now controlling motor-coach lines to give them up." It would seem that the possibility exists of going too far in this direction.

a larger system. In such cases the advantages which competition may possess are likely to be purchased at too high a price; and the public should choose which agency it will have, not through the incidence of its patronage, but by state action. Often, moreover, in order to develop traffic in an area, a period of unprofitable operation must be experienced; and where this is true, no agency is likely to undertake the work of development if it faces the prospect of sharing immediately such traffic as appears. There can be no doubt, also, that unmitigated competition prevents that stability of service and rates which is especially important in transportation. The schedules of departures of rival agencies should be related more logically, and rates be less fluctuating, than the strategy of unrestricted competition would allow them to be. But these and other similar considerations do not wholly efface the virtues of competition. The incentive to growth which it provides has been clearly evidenced in the improvement in rail service, and in the more conspicuous anxiety of the railways to please the public, consequent upon the development of motor transport. "An all-embracing consolidated system," as Professor Daniels has said, "would grow immune to the disturbing quest for betterment."[12] And when duplication means the provision of dissimilar facilities, in the majority of situations the competitive aspect is outweighed by the fact that no one agency could serve the public with the same adequacy and particularity that all can together. Variety is advantageous, and this variety, as was brought out in the above instance of passenger transport between New York and Boston, consists not only in different services, but also in different rates. It is a naïve view that transportation, or other industries for that matter, must exist in one or the other of two unqualified conditions, unrelieved competition or complete monopoly. The problem of realizing fullness of service and effectiveness of incentives with minimum waste can be solved only in the specific instance, and there only by compromise and the avoidance of extremes. This is sometimes what is meant by co-ordination—a "*via media* between undue competition and unrestricted monopoly."[13]

[12] See n. 1, above.

[13] Fenelon, *Transport Coordination*, p. 68.

But even if the desirable degree of competition were known, the procedure for achieving it would still be debatable. Those who regard co-ordination as a substitute for competition, usually look upon unified control as the means of getting it. But quite apart from the popular antipathy in this country to allowing the strong to gobble up their weak competitors, there may be sound reasons for looking primarily to another solution. Certainly the necessary reduction of competition lies within the power of regulating authorities to restrict entrance into particular fields of service and to control rates, routes, and schedules. Motor-carrier laws such as are now effective in most states confer sufficient authority for this purpose as respects intrastate commerce, except as private vehicles present a difficulty insoluble by any method. Certainly a more discriminating curtailment of competition may be expected in this way than through intrusting the solution to private interests whose real desire may be the elimination of all competition. However, in the special case of urban passenger transport, much is to be said for complete monopoly, adequately regulated if not municipally owned. Surface, underground, and elevated electric railways and bus lines, while often alternative to each other, are intimately connected at innumerable points in a complementary way. It is important to be able to mass facilities quickly at vital points to meet periodic requirements. It is extremely important to conserve street space. The cost of expansion is so great, and the desirability of facilitating movement at low rates so imperative, that wasted capacity must be avoided. A socially defensible distribution of population requires constant extension of residential sections, if the city is growing, and the need for extending transport facilities in advance of traffic necessitates some protection of the investment. Costs, perhaps for long periods, must be borne by other more profitable services, and the permanent continuance of subsidies of this sort is often consistent with the accepted view of urban transport. These considerations are commonly applicable in much smaller degree to the movement of freight and passengers between localities.

CO-ORDINATION CONCEIVED AS RAILWAY CONTROL

Co-ordination may mean, not a solution in the public interest of particular problems of inter-carrier relationship, but simply the placing under the railway wing of the junior members of the transport family. Not always, but very often, the railway executive who discusses the matter begins with vague but deferential references to one or more of the objectives already considered, and then proceeds with a description of the way in which the railways are, for example, using motor vehicles, including under co-ordination all such uses, however unconnected with the purposes originally stated.[14] The position is taken that railway companies have properly outgrown their exclusive preoccupation with railway operation, and have become *transportation* companies—an extension of function suggested but not justified by their leading place in the field.[15] The gains expected through such use of subordinate agencies are of three types: first, the auxiliary itself may prove profitable; second, the substitution of it for more costly rail operations may reduce expenses; and third, it may be used to increase rail traffic. It is convenient to consider these expected gains with special reference to railway participation in motor transport.

The first of these benefits is of least importance, even though examples can be cited, such as the New England Transportation Company, which have proved quite profitable. If the keen competition existing in the motor-transport field, both of public and private vehicles, permits a more than normal return on the investment, it may be expected that rate reductions through regulation will ensue; and if only a normal return on the additional capital invested in motor facilities is received, there is no improvement in the revenue position of the railway.

Important economies are being realized through the use of

[14] An example is the above-mentioned article, "Transportation Coordination," in the *Railway Age*, Motor Transport Section, April 26, 1930.

[15] This attitude, while frequently expressed in America, has been even more emphasized in Great Britain in connection with the quest for "road powers." Thus Sir Josiah Stamp reported to the shareholders of the London, Midland, and Scottish Railway: "Your Board is determined that the company shall in one way or another share in the road business." *Modern Transport*, March 9, 1929.

trucks and busses to replace more costly operations by rail.[16] The conversant reader will be familiar with examples of the facilitation of main-line rail movements by employing motor vehicles to serve the less important stations, with the reduction of train service on poorly patronized branch lines, or their complete abandonment, and with the possibility, in undeveloped areas, of preceding railway construction with the operation of motor services while traffic is light. The economies thus realized are undeniable, but not all are imputable to railway control of motor transport. Where the motor vehicle performs an integral part of the rail service; where the motor service requires a measure of subsidy; and where suitable arrangements cannot be made with independent motor carriers, even under regulative pressure; railway control is responsible for the saving. Otherwise it is not. In the most important type of case, that of the displacement of unprofitable branch-line services, the saving to the railway comes through the abandonment of rail operations, not through the inauguration of motor services. Only in the exceptional case where the permission to abandon is made contingent upon the assumption by the railway of responsibility for the substitute motor service, is the saving attributable to co-ordination in the present sense.

Railway operation of motor vehicles for the purpose of holding traffic or bringing it back on the rails may take either one of two quite different directions. In the first place, joint motor-rail services may be established which prove superior to rail service unassisted, and thus win traffic which would otherwise go to independent motor carriers. This point was illustrated above in connection with the railway operation of busses and airplanes. Similar in effect is the use of trucks to avoid transfer points and circuitous routes. Whether these services really require railway control of the other agency depends upon the same considerations as were mentioned in the last paragraph. Often such con-

[16] A possibility of saving exists, whether motor vehicles are used substitutively or not and whether or not they function in joint services, whenever part of the railroad organization or facilities, otherwise not fully used, can be made to serve associated road operations.

trol is necessary, and seldom could there be any objection to it, if only a complementary relation of agencies is involved. The second way of gaining traffic for the railway by operating motor services, namely, through controlling competitive motor carriers, is doubtless nearer the real intent of the railways in stressing co-ordination. Such control may be obtained readily in the case of bus lines, provided such lines possess certificates that will exclude new competitors; but without this protection, the threat of rate-cutting by railway busses may deter incipient competition. The motor-freight field is more difficult to control because of the predominance of private trucks. It is obvious that once a railway has road competition under control, it can contribute most to its revenues by curtailing motor service. Positive curtailment may lead to difficulties with the authorities; but it is possible to check the development of new parallel services, and this is important. More important is the possibility of keeping rates on a higher level than independent motor carriers would have them, and thus invite traffic to the rails.[17] If the rates charged by independents are too low to be permanent, through failure to cover all costs, or if the railway must be protected in the public interest, this policy may be justifiable; though the public power of certification might well be a more trustworthy means to the same end. But if neither of these conditions is present, and this is commonly the case, the public will be deprived of a more economical service which it has a right to enjoy.

The possibility of a profit from the motor subsidiary, and the expectation of an increase in net revenue from rail operations, either by reducing expenses or by increasing traffic, are the substantial economic reasons for the railway operation of road services, but there are other important factors of an intangible sort.

[17] R. J. Littlefield, manager of the Boston and Maine Transportation Company has stated: "Some routes may be of questionable value financially, but railroads must choose between establishing certain routes which may be only self-supporting, or perhaps operated at a loss, and allowing an independent operator to get control with the possibility of rates being reduced to attract still more business from the railroad. . . . . This policy of protecting rail revenues has eliminated all motor coach competition of any consequence in Boston and Maine territory except on one route. . . . ." *Proceedings, American Railway Association, Motor Transport Division, June, 1928*, pp. 43 and 44.

There is no doubt a purely sentimental desire to keep traffic under railway auspices, and the satisfaction from besting a competitor is probably a contributory incentive. It seems often to be forgotten that traffic carried by railway-operated trucks and busses occasions the additional cost of owning and operating these facilities, and while so moving does not bear any of the cost of rail operations. Railway traffic officials seem often to think principally in terms of tonnage and passengers, rather than in terms of their contribution to net revenue. It is probable also that the enthusiasm for railway participation in road transport has arisen partly from the new opportunity to distinguish themselves presented to railway under-officials through this extension of railway activity. Strong support of this development comes also from the belief, shared by many members of the public, that the transportation experience of the railways and their high sense of public responsibility make them the ideal operators of motor facilities. This belief, which bears upon the quality of motor-transport performance equally in co-ordinated and wholly independent services, could be supported by citation of numerous examples of irresponsible operators. But such irresponsibility is mostly due to the youth of the industry, independent operators of good reputation are now in the majority; and separate, specialized management of motor services is doubtless superior to direct railway control, as evidenced by the preference of the railways for operating motor facilities through subsidiaries with a fairly independent personnel.

SUMMARY AND CONCLUSION

Multiplication of transport agencies has created the need of fitting them together into a systematic arrangement. If co-ordination means no more than the formation of some sort of coherent whole from these constituent parts, the desirability of it will be generally admitted. But those who now use the terms so frequently have usually certain quite specific ends in view; and these specific ends are diverse, partially inconsistent, and attainable by dissimilar means. He who asserts that "the term 'co-ordinated transport' is one which has come to have a definite

and specific, almost a technical meaning," either thinks too vaguely to apprehend sharp cleavages where they exist, or else seeks, on the assumption of general vagueness, to appropriate for his own particular plan the favor attaching to the general concept.

The variety in the situation, as we have seen, is variously manifest. The results which co-ordination may be intended primarily to achieve—results which correspond to the several problems of inter-carrier relationship—may consist in the economic allocation of functions among agencies, or in the establishment of well-organized joint services, or in the elimination of competitive waste. The means of achieving these results, or certain of them, may be through competition, or voluntary inter-carrier arrangement, or public regulation, or unification, or some combination thereof. If a definition is required, the following would be available:

> Co-ordination is the assignment, by whatever means, of each facility to those transport tasks which it can perform better than other facilities, under conditions which will insure its fullest development in the place so found. Co-ordination is the creation, in any way at all, of effective joint services by agencies which are directly complementary. Co-ordination is the attainment of such a compromise between monopoly and competition as will insure the continuance of essential agencies, maintain the maximum variety of service, eliminate undue waste, and preserve effective incentives to improvement. Co-ordination is the avoidance of duplication through the subordination of rival agencies. These definitions are not necessarily inconsistent, but they involve radical differences in emphasis, and suggest divergent programs of execution.

In the field of inter-carrier relationships, one distinction, finally, may be restated. The creation of effective means for traversing the public highway and the air has opened opportunities for diversifying transportation, not only through inaugurating motor-vehicle and airplane services, but also through air-rail, rail-motor, and other joint services. The exploiting of these opportunities is the business of transportation people, with possibly such regulative guidance—such aid, compulsion, or restraint—as may in instances seem necessary. But the settlement of larger questions—the determination of the range of service

properly belonging to each means of transport; the charting of a safe course between competitive and monopolistic extremes—must rest finally with the general public, and be accomplished through the bestowal of patronage and the exercise of legal authority. In a situation like the present one, which change has rendered somewhat chaotic, a tendency exists to strive for order and system above all else; to determine where each element belongs and put it there.[18] An orderly, well-organized transport system is, indeed, an ideal to which we should suitably defer in formulating policies. But it would be short-sighted not to recognize that any significant development must involve some measure of disturbance that time alone can cure. Transportation is basic and its methods must go forward. An adjustment of agencies truly harmonious from a standpoint embracing future, as well as present, will not impose too rigid a regulative harness, nor intrust too unreservedly the nurture of new facilities to those who fear them. So, at least, it appears to the present writer. But this is a private view which may be disputed. Beyond debate is the desirability, in achieving suitable relations between carriers, old and new, of apprehending the precise nature of the problems which exist and the character and consistency of the remedies proposed, instead of permitting these things to be scrambled indiscriminately together.

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[18] As manifest, for example, in the lengths to which some of the states have gone in their motor-carrier laws, and in the interpretation of convenience and necessity.

THE ITALIAN DEMOGRAPHIC PROBLEM AND THE FASCIST POLICY ON POPULATION

I. THE DEMOGRAPHIC SITUATION OF THE WHITE POPULATION WITH SPECIAL REFERENCE TO ITALY

ITALIAN population policy has its roots in recent scientific researches in vital statistics and the evolution of nations, a field in which Italian scientists have been pioneers. A summary of the outstanding results of these researches may afford an appropriate introduction to the present article. Vital statistics, in all the white-race countries (save perhaps some of the South American states possibly not quite free from hybridation), show a more or less marked but, generally speaking, very definite decrease in the birth-rate. At the same time, however, there has occurred a reduction of the death-rate which has partially or totally balanced the lower rate of births. Thus, the rate of natural increase in population either has not yet declined, or has declined later and less markedly than has the rate of births. In those countries, however, where the decrease in the birth-rate is most marked, there has been already a clear decline in the natural increase.[1] Such is the situation of Italy, where the birth-rate, reaching a maximum of 39.3 per thousand in 1876, has fallen gradually to 25.2 per thousand in 1929. The natural increase of the Italian population, at a maximum of 14.2 per thousand in 1912, has decreased to 10.5 per thousand in 1928 and 9.1 per thousand in 1929.

The demographic balance of all white-race countries, however, displays an excess of births over deaths—an excess which is remarkable in some cases. Only in France, in the least favorable years, and lately also in Esthonia, does it show an actual deficit.

Many people, fixing attention merely on these facts, have be-

[1] For a survey of the evolution of birth-rate and death-rate in the principal countries, cf. C. Gini, "La dinamica delle popolazioni," in *Trattato Italiano d'igiène*, Vol. XVIII (Turin: U. T. E. T., 1930).

come alarmed at the prospect of overpopulation. But careful investigation shows that it is peculiarly misleading to interpret the evidence in this way. The present excess of births depends, at least partially, and exclusively for some countries, upon the abnormally high proportion of the population in those age-groups between twenty and forty. This age-class, to which procreation is almost exclusively entrusted and from which comes but a meager contribution to deaths, is now disproportionately large, by virtue of the fact that the number of births increased up to the beginning of the century and diminished only thereafter.[2] If one eliminates the effect of this transitory circumstance, it is clear that the condition of the white race, from the standpoint of demographic vitality, is far from favorable.

Comparing the number of females from twenty to thirty years of age, as ascertained by the most recent censuses, with female births during recent years, one is convinced that the latter cannot reproduce in twenty to thirty years the number of the former—allowing, of course, for prevailing rates of mortality. In England and Wales, for example, the last census of 1921 counted 3,323,000 women between twenty and thirty. The average number of females born yearly in recent years (1927 and 1928) has been not quite 322,000. That means that, if no English woman should die at an earlier age than thirty years, we must expect that in a generation there would be 3,220,000 women between twenty and thirty, that is, a number less than that of the last census. But in reality about 15 per cent of the females born in England and Wales die before that age. So, we may expect that in a generation the female population of England and Wales between twenty and thirty will be diminished by more than 15 per cent. Not essentially different, though perhaps not every-

[2] Cf. especially R. R. Kuczynski, *The Balance of Births and Deaths*, Vol. I, *Western and Northern Europe* (New York: Macmillan, 1928); and C. Gini, "The Death of Nations," in "The Cyclical Rise and Fall of Population," in *Population* (Harris Foundation Lectures, 1929; Chicago: University of Chicago Press, 1930). Cf. also L. I. Dublin and A. J. Lotka, "On the True Rate of Natural Increase," in *Journal of the American Statistical Association*, September, 1925; "The True Rate of Natural Increase of the Population in the United States. Revision on Basis of Recent Data," *Metron*, VIII (1930), No. 11, and C. Gini, *I fattori demografici dell' evoluzione delle razioni* (Turin: Bocca, 1912).

where so serious, are the conditions of Scotland (and probably also Ireland), Finland, Esthonia, Latvia, Sweden, Norway, France, Belgium, Germany, Switzerland, Austria, and probably Hungary.[3] In other words, the populations of all the states of Western, Northern, and Central Europe should be considered as virtually on the way to decrease, with the exception of two small states, Holland and Denmark, the latter of which does not seem, on the other hand, very far from the conditions of the other Scandinavian states. But in Italy and Spain (the data for Portugal are wanting), and all the Slav nations of the south and the east of the virtually decreasing populations, population gives promise of continued increase.

The countries outside Europe, for which the data are at hand (Egypt, Canada, Argentine, Chili, Australia, New Zealand, the Union of South Africa, Japan, and probably British India), are still effectively increasing in population. The United States instead seem to be near to, if not already in, a virtually stationary condition.[4] It has been calculated that this stationary condition will become effective between 1965 and 1970; after these dates the population of the United States is expected to decline. The decline will begin even sooner in some European countries. It is expected in 1937 for France, in 1942 for Great Britain, in 1946 for Germany.[5]

However, for the other white-race countries, especially for Italy, there arises a problem: Are they truly in a completely dif-

[3] Cf. C. Gini, "The Death of Nations," *loc. cit.*, see note on pages 81–83.

[4] Cf. C. Gini, "The Death of Nations," *loc. cit.*, and Dublin and Lotka, *op. cit.*

[5] Cf., for France, A. Sauvy, "La population française jusqu'au 1956, Essai de prévision démographique," *Journal de la Société Statistique de Paris*, December, 1928, and January, 1929; for Great Britain, A. L. Bowley, "Births and Population in Great Britain," *Economic Journal*, June, 1924; for Germany, "Richtlinien zur Beurteilung des Bevölkerungsproblems Deutschlands für die nächsten 50 Jahre," *Statistik des Deutschen Reichs*, Vol. CCCXVI. The information for the United States has been kindly given to me by Dr. Dublin. The results of similar calculations for Italy are summarized in my paper presented to the Nineteenth Session of the International Institute of Statistics; C. Gini, *Calcolo di previsione della popolazione italiana del 1921 al 1961* (Tokio, 1930). Cf. also, on the same subject, the *Notiziário demografico* edited by the Central Institute of Statistics of the Kingdom of Italy; April 16 and May 1, 1930. A more detailed report will be published shortly in the *Annali di statistica* edited by the same Institute.

ferent condition from that of the states of Northern, Central, and Western Europe, so that their demographic future may be contemplated with assurance, or do they find themselves only in a preceding stage of the same demographic evolution, wherein the germs of decadence are not yet manifest?

Multifarious indications induce eminent men of science to think that human populations, like individual organisms, in their evolution, follow a cycle.[6] Whoever admits such a theory finds, in demographical statistics and in the social manifestations of the white populations of the present, not a few symptoms of a more or less advanced senility. And other persons, who do not bind their forecasts to the conception of biological cycles, hold that, for sundry causes, the white populations are doomed to a more or less rapid decline, if not altogether to extinction. Still others, instead, hold that the present trend leads to a stationary level which is destined to become the normal condition of civilized populations; and, finally, others are confident that the amount of a population may in future be rationally regulated by means of a control of births, so as to be kept in that condition which corresponds to an "optimum" from a qualitative and quantitative point of view.[7]

II. THE EFFICACY OF THE GOVERNMENT INTERVENTION IN THE DEVELOPMENT OF POPULATION

Under such conditions three questions may be raised: (1) Is a demographic policy on the part of the state justified? (2) Can one foresee that such a policy would be effective? (3) In what direction should such a policy be carried out? A negative answer to the first question signifies that the state has properly no concern about the increase or decrease of its population. Such a view is hardly defensible. The second question arises for all

[6] Cf. C. Gini, "The Cyclical Rise and Fall of Population," *loc. cit.*

[7] Cf. C. Gini, L'optimum quantitativo della popolazione," in *Nascita, evoluzione e morte delle nazioni*, "Libreria del Littorio," (Roma, 1930). This report and the following discussion may be found also in the mimeographed proceedings of the round-table conferences held by the Norman Wait Harris Foundation (University of Chicago) in June, 1929. Cf. *Population and Migration*, III, pp. 793–856. On the same subject, cf. an earlier article "Considerazioni su l'optimum didensità della popolazione," *Economia*, July, 1927.

those who admit that the present populations tend toward stationary levels or permanent decline but, above all, for those who hold that the evolution of a population follows, owing to biological causes, a cyclical trend. This last theory, however, does not necessarily lead to the conclusion that the intervention of the state must be ineffective, just as the acknowledgment that life in an individual follows a cycle does not lead one to deny the wisdom of direct intervention aiming at prolonging life or eliminating some of the causes of death.[8]

Certainly there are not lacking examples in history, both ancient and modern, of the inefficacy of governmental measures aiming at checking a decrease in birth-rate; but one can maintain that the government's interference was undertaken too late, when the demographic crisis was too advanced, or that it was not properly directed.

The wisest means to increase a population is certainly that of favoring the natural tendency to expansion of the demographically most vigorous branches, instead of forcing the reproduction of the less fertile individuals or classes. Special tax-levies upon bachelors and couples with few or no children, if they are to be recommended from a fiscal point of view, may have indirect advantages from the standpoint of population, for funds thus raised may be used to promote demographic increase; but their direct consequences are probably of little importance.

To assist in their struggle for life the most numerous families, to lessen the high death-rate which partially annuls their contribution to future generations, and to retain or transplant their members to places where the natural tendency to expand—partially hereditary—meets with fewer social obstacles, this is the most suitable program. In such a scheme are included provisions for checking emigration, abroad, on one hand, and toward the cities, on the other. Being more easily recruited from the most fertile classes, emigration deprives nations of their most vital stocks or exposes them to the deteriorating action of urban surroundings. The program also includes transplantation—a

[8] Cf., on this subject, C. Gini, "Problemi della popolazione," *Annali dell' Istituto di Statistica della R. Università di Bari* (1928), p. 11.

classical method of colonizing of Latin stocks—of persons belonging to prolific families, to deserts or to lands relatively uninhabited. Such a practice, because of the race mixtures which inevitably result, cannot but be favorably regarded by scientists who see in the cross-breeds the prime source of the birth and revival of nations.

On the other hand, the use of subsidies paid according to the number of children born, seems, in the light of experience, less clearly effective. It is not practicable to make the subsidies large enough to compensate families for the expenses of additional offspring. Indeed, the system may only fortify that dangerous economic psychology which, getting the upper hand over instinct, constitutes the most powerful and immediate factor in the decline of births.

Just as the object is different, so also is the result, of special awards to families of exceptional prolificness, when this is coupled with exceptional endowments from a civic, physical, and moral point of view. Such payments, owing to their irregular character and amount, cannot be considered as compensation and imply no right on the part of beneficiaries. Yet they do contribute to a program which aims at honoring maternity and glorifying family-life.

There are reasons for thinking that difficulties as to housing and employment do not often constitute the determining factor in the limitation of offspring, but are used as an excuse for an already existing tendency. But one cannot deny that by eliminating such pretexts some results may be obtained. More telling, of course, are provisions for cultivating and reinforcing those feelings of family solidarity, national loyalty, and religious sentiment, which, while they cannot serve as substitutes for a genetic instinct, do represent powerful allies in the struggle against the invading rationalistic egoism.

That one should give attention above all to the birth-rate, in a demographic policy of encouraging natural increase, does not imply that the death-rate should be neglected. Its reduction augments the natural increase and is not harmful from a qualitative point of view, so far as it involves reduction of deaths

from causes which have not a selective character, as are frequently the deaths of illegitimates and orphans and deaths from infectious diseases. Mussolini's formula, "Maximum birth rate, minimum death rate," certainly constitutes the most efficacious program of a demographic propulsive policy.[9]

III. REASONS FOR A PROPULSIVE POPULATION POLICY IN ITALY

If then, one maintains with confidence that the intervention of the state, wisely directed, may stimulate the growth of population, there remains the question whether action in this direction is justified in Italy at present. There is certainly a possibility that in the future the vitality of the Italian population may diminish; but such a danger does not seem imminent; and some will hold that measures necessary to avert it may be taken when it has manifested itself. Some consider that there is at present, not a scarcity, but a superabundance, of men. Evidence of this is found in the tendencies of the laboring classes to emigrate and of business men to contract loans in foreign markets, and in the persistence of unemployment.[10]

As regards unemployment it is not difficult to answer that scientific analysis has by this time revealed that its explanation in the time we are passing through is not to be found in an excessive number of laborers. It is, instead, essentially caused by the inertia of wages in following changes in commodity prices. Such inertia is, to some extent, unavoidable; but, in part, it represents the consequence of that rigidity in the wage system which results from extra-competitive controls—a rigidity analogous to that of fixed prices, now applied to so many goods and services. This system of relatively inflexible wage-rates is continually spreading, owing to its obvious advantages in avoiding frequent disputes and long negotiations. A certain amount of unemployment

[9] Cf. B. Mussolini in the Preface to the Italian translation of the pamphlet of Dr. R. Korherr, *Regresso delle nascite, morte dei popoli* (Rome: Libreria del Littorio, 1928).

[10] The question is discussed in the article of C. Gini, "Le obiezioni alla politica della crescente natalità," in *Archivio fascista di medicina politica* (Parma, September–December, 1928).

results, therefore, unavoidably in a modern nation, especially as its industries become more highly developed and specialized.[11]

On the other hand, the tendency, whether of labor to emigrate or of business men to import capital, is governed exclusively by individual economic advantages. But the state, besides considering the welfare of single individuals, must take account of the collective economic power, in which average individual income is only one of the component factors. Besides economic considerations, it must take account of others, among which military considerations are not of least importance. The relation between the size of population and the economic and military power of the nation is obvious.[12]

Furthermore, the state must have at heart not only the advantage of the present generation, but also that of generations hereafter. Mussolini was quite right when he said that one who is not able to look at least fifty years ahead has no right to rule a nation. It is an illusion to think that the intervention of the state, carried out when the danger of depopulation has appeared, may change the situation. The fact is that, on the one hand, the number of births at a certain moment is largely determined by the amount of the population (and especially the female population) in a productive age, and this essentially depends on the number of the births which have occurred from twenty to forty years before; on the other hand, that the lever of governmental provisions does not work—the example of ancient Rome shows it clearly—when it has allowed the psychological basis of the family to be undermined.[13]

The demographical situation of a nation must, moreover, be viewed in relation to that of neighboring states. Now, from an

[11] On the relations between unemployment and overpopulation, cf. the article of C. Gini, "Disoccupazione e sovra-popolazione," *Atti della Societa Italiana per il Progresso della Scienza* (September, 1928), where the various theories are discussed.

[12] Cf. the "Report on the Population Policies of Different Nations" and the following discussion in *Population and Migration*, II, 559–624. The report is published in Italian, and the discussion is summarized and commented on in the above-quoted volume: *Nascita, evoluzione e morte delle nazioni.*

[13] Cf. "Problemi della popolazione," *loc. cit.*, pp. 11–13, and the discussion of the above-cited "Report on the Population Policies of Different Nations."

international point of view, it is clear what the future prospects are, if, as everything makes us believe, the latent demographical crisis of Northern, Central, and Western Europe is destined to manifest itself and become accentuated. Either such populations will be followed at a short distance on the same path by other nations of the white race which surround them, or the latter will continue instead, for a long time still, in their ascending development. In any event, one sees as inevitable some great disturbance which would re-establish an equilibrium between the zone of demographic depression and the border areas of increasing pressure. The size of the depression zone would naturally vary according to the two hypotheses considered, and consequently the range of races eligible to displace the senescent populations would be different. In the latter case the peoples brought into the depression zone would presumably be white; in the former, they would be yellow, Indian, or Malaysian.

In any event, it is vital for a nation like Italy, which finds itself on the margin of the zone of demographic depression, to avoid being drawn in, and to await the future in a condition of the utmost demographic potentiality. Here is the scientific basis of the propulsive population-policy adopted in Italy by will of Mussolini.

IV. THE FASCIST POLICY: APPLICATION

Let us now examine in more detail the principal steps taken by the government and by local bodies to implement this policy.

By the law of June 14, 1928, No. 1312, and by Royal Decree of August 10, 1928, No. 1944, the government introduced most generous tax-exemptions for larger families: (*a*) an exemption of 100,000 lira of total income from the progressive, complementary tax on income and from the additional levies of the communes; (*b*) a partial reduction for higher incomes, so as to exempt 100,000 lira from the tax on "movable income" and from the communal tax on industries, from the related provincial tax, from the tax in favor of the provincial economic councils (normally levied on the same base), from the taxes (and additional levies) on lands and buildings, and from those on agricultural

profits; (*c*) total exemption from the communal taxes on licenses, on house-rents, on cattle, from the special tax on goats, from syndicate-contributions, from taxes (and additional taxes) for every order and grade of schools and educational institutions. These partial or total exemptions from taxes are enjoyed by the officials and employees of the state (even if they are on the pension list) and those of other public bodies, when they must provide for seven or more children of Italian nationality; also by those who, even if they are not in public employment, have to provide for ten or more children of Italian nationality or have had twelve or more children, quick-born and vital, of Italian nationality, whereof six must be provided for.

The Decree deserves also to be particularly considered because it establishes that, in the computation of the children, there shall be included, besides those legitimate, also natural children recognized by one parent. It extends, then, to natural families, those provisions which up to now were reserved for legally constituted families. In this manner, the acknowledgment of children is encouraged, merely through pecuniary incentive to be sure, but with obvious moral and material benefits to illegitimate children.

Measures unfavorable to the unmarried have also been enacted. Of the tax on bachelors we shall speak later on. Here we wish to mention the law of June 6, 1929, No. 1024, containing provisions in favor of demographic increase. By this law, bachelors and spinsters may no longer be given preference for employment by the state, provinces, communes, or other public institutions. Indeed, other things being equal, married persons with children must always be given preference over those without children; and these, in turn, over the unmarried. Such provisions are also extended to contracts of private employment. Mussolini has announced[14] that rules of public bodies or associations and corporations under state control, which exclude married women from employment or grant preference to spinsters or women with one child, are no longer compatible with the demographic principles of the government.

[14] Circular of November 17, 1928, issued by the Ministry of Interior, No. 2698.

Similar discriminations against the unmarried and against childless couples are practiced in the allotment of the workmen's dwellings and of inexpensive houses built with the assistance of the state, provinces, communes, and public charity institutions. Similar provisions regulate grants and administrative authorizations. In addition, the government has undertaken to provide family allowances for its employees of lower rank with children under age. These allowances vary according to the classes of employees from 150, to 135, 130, and 50 lira per month, and are made in addition to the grants of 30, 25, 20, and 10 lira, respectively, per month for each child up to three, the contribution being doubled when the number of children exceeds three (Law of June 27, 1929, No. 1047).

These laws are intended to assist those who have families to support. Others aim instead at protecting and assisting maternity and infancy. By the law of December 10, 1925, No. 2277, the government has undertaken to protect women during childbirth and infants from the suckling period through the preschool and school years. It is a vast program, still in process of development, entrusted by the state to an institution known as "Opera Nazionale della Maternità e dell' Infanzia"—a program which places Italy in the vanguard among the nations with respect to this sort of social legislation.

I should hope so!

According to Article 4 of the law, the "Opera Nazionale della Maternità e dell' Infanzia" is charged with the task of protecting and assisting: (1) women during pregnancy, especially needy and abandoned mothers; (2) suckling children and weaned ones up to the fifth year if they belong to needy families; and (3) children physically or psychically abnormal and children abandoned, strayed, or delinquent, up to the age of eighteen. The "Opera Nazionale" has also been entrusted with the task of disseminating scientific methods of prenatal and infant hygiene; of establishing clinics for the care and supervision of women during the period of gestation and especially for the treatment and prevention of syphilis; of founding schools for training in the care of infants; of organizing popular instruction in infant and maternity hygiene; of establishing, in co-operation with provincial

governments, antituberculosis associations; and of assisting the local authorities in combating infant-diseases and especially in antituberculosis prophylaxis work.

By the same law, hospitals, lying-in stations, and similar institutions are obliged to provide, within the limits of their facilities, for the care of women beyond the seventh month of pregnancy, during confinement, and four weeks after delivery, even if the women, according to regulations of the institutions, are not entitled to free service. Furthermore, the rules enacted in 1907, regarding absence-leave for women in industry during childbirth, are made applicable to public employment.

The vigilance and protection of the "Opera Nazionale" is also extended to children for whom parents are unable to provide and to those in morally dangerous surroundings. The children may be placed in institutions or elsewhere to guarantee proper care. Employment of children under fifteen in theaters, circuses, and similar places—so often abusive and morally harmful—is forbidden. Their attendance at certain cinematographic spectacles may also be prohibited. It is forbidden to sell or give alcoholic drinks to school children, to serve them such drinks in public places, or to provide them with tobacco in any form. The "Opera Nazionale" is authorized, by the Law of May 8, 1927, No. 798, to assist children born of illegitimate union and recognized by the mother alone, when the latter intends to suckle and raise the child. But the law, while it comes to the aid of the fallen woman, prosecutes abortion as a crime. It not only punishes the culprit and all accessories, but also provides, by means of police regulations, for the deportation of those physicians and midwives known to have repeatedly participated in this illegal practice.

Measures of the kind contained in the laws for protection of maternity and infancy involve large expenditures. To provide necessary funds, the state instituted, January 1, 1927, a progressive, personal tax on bachelors, from twenty-five to sixty-five years, inclusive, supplemented by another levy progressive according to the total income received by each bachelor. Further discrimination in taxation has been effected recently (1930) against bachelors and couples with less than two children. The

inheritance tax, previously abandoned for transfers within the family, has been re-enacted, though at low rates, as against these groups.

Other measures have been taken to prevent depletion of our demographic wealth through emigration. The government, without totally prohibiting emigration, has endeavored to reduce it drastically and also to encourage the return of subjects who have already departed. Effort is made to absorb additional labor in agriculture, which, as it becomes increasingly intensive, requires more hands. In particular, our department for the general direction of Italians abroad, has endeavored to persuade Italian women, resident in France, to return to their home towns in Italy to be delivered, for the child of an Italian subject born in France is considered French. The persuasion-activities of the department are supplemented by financial inducements—refund of traveling expenses and assistance at child-birth by means of subsidies.

Another provision not less efficacious, to which the Italian government pays a great deal of attention is the reclamation of land. To a special Under-Secretary of State is entrusted the duty of administering the far-reaching laws which have been enacted by the government in this connection. In view of the great advantage that the reclamation of land has for the nation, from economic and financial as well as from sanitary and demographic points of view, a high percentage of the expenses of reclamation is met by the government or the local authorities. It is calculated by some authorities that the land to be redeemed will accommodate a population of ten millions. It is also anticipated that the production from redeemed land and the intensified production of other districts may render Italy self-sufficient in regard to the consumption of wheat. In the meantime, it is clearly perceptible that several zones, in which the work of reclamation has made most progress during recent years, show no reduction in the birth-rate, and in many cases show an increase. The government has facilitated the development of their population by transferring, to areas to be reclaimed, families from the more prolific communities of the Venetian and Emilian country.

We have already referred to the damage resulting from increased urbanization. Migration to the towns deprives agriculture of hands, sometimes provokes economic crises, and aggravates the housing problem in our urban centers. Nor must we forget the damage caused to the race by forsaking the free life of the fields for the unhealthy life of the city. Mussolini has personally called attention to the progressive decline of the birth-rate as a consequence of the monstrous growth of cities. Country people, drawn to the cities and taking up residence there, become less prolific. At the same time, through depopulation of rural areas, agriculture decays. This means a deficiency of the fundamental means of subsistence and progressive impoverishment of the nation.

By the Law of December 24, 1928, No. 2971, there has been conferred upon the Prefects the power and duty of curtailing the increase of urban populations. All those who arrive in cities without means of support and those who, having received promise of jobs, remain unemployed and have not the prospect of securing employment within a short time, all these must be sent back to their homes and warned not to return to the city whence they have been expelled. The application of this law is not intended to create a residence-monopoly for laborers already established in the towns. Indeed, it must be carried through entirely in that spirit of social equity corresponding to the higher principles of moral order which have inspired and dictated it.

Besides this action of the state, many similar measures, constituting an elaborate system, have been taken by local bodies, in accordance with instructions issued by Mussolini. Some of these have already been mentioned in connection with the matter of tax-exemption. We wish to mention here the numerous bonuses and prizes granted by the communes as rewards of fertility. Some are merely fixed allowances for each child born; some are in the form of annuities paid for each child after the sixth or eighth, and continued up to the child's fifteenth year. Frequently, communes provide for special grants to the family or families considered most promising for demographic ends, to those having the greatest number of children, and to those which have been

most prolific during given periods of time. For example, one commune has established five yearly prizes of 100,000 lira each, payable to those families which have had the largest number of children during the preceding six years. The sums are deposited in a bank, in favor of the children; the interest is payable to the parents and the principal to the children as they become of age. Many communes issue diplomas and confer medals in such cases.

Other localities grant reduction in tram-fare, or free tram-service, to large families, or offer reduced rates for gas and electricity. Some make such families eligible for poor-relief, provide free medical service and free medicines, or reimburse the expenses of child-birth. Children of large families are often provided with school books and supplies; they are sometimes admitted on special terms to mountain and seaside colonies; and special educational scholarships are made available to them.

Sundry mountain communes have endeavored to check the exodus to the cities by subsidizing construction of modern homes, in place of the old timber cottages. Others have tried to improve living conditions by introducing electric lighting, installing water-works, improving roads, and, above all, by starting regular motor-bus service to and from nearby cities, in order to lessen the degree of isolation.

The press has carried on effective propaganda-work, by publishing data on the demographic movement, reproducing portraits of large families, and by granting prizes to communes showing the highest birth-rates. Mussolini himself has taken part most actively in this campaign of popular education. He has appealed to the people at every opportunity, and has personally conferred prizes upon prolific parents and upon women having more than one child at a time. He has written for newspapers and journals; and his preface to Doctor Korherr's book has provoked much thought in Italy upon our population-problem.

The renewed religious fervor, which has been encouraged by the government, also helps greatly in the struggle against the decrease of births. It strengthens family ties; it makes parents consider their offspring as a gift of God and the wealth of their country; it opposes to individual egotism the tranquil, domestic

joys; and it points to numerous offspring as the best guarantee of a serene old age.

The whole campaign against the decrease of births was begun only recently, too recently, perhaps, to permit measurement of its results. Indeed, these results may never be estimated accurately, for the course of birth-rate and the rate of natural increase should, for this purpose, be compared with that hypothetical course which they would have followed if Mussolini's propulsive policy had not been attempted. However, it can safely be stated that this policy has been beneficial, in as much as it serves as a sort of dike for Italy, protecting her from those neo-Malthusian tendencies which are undermining the future of other nations. If it meets with adequate response in the national consciousness, it will prove a great advantage to Italy in the contest of nations for survival.

One cannot better conclude this discussion of Italian population-policy than by citing the words of Mussolini, its principal artificer:

> My conviction is that, even if the laws were shown to be of no avail, it is necessary to try them, just as all sorts of medicines are tried when, and more especially when, the case is a desperate one.[15] . . . . But I think that our population measures, negative and positive, may prevent or retard the decline, provided the social organism to which they are applied is still capable of reaction. In these matters, more than formal laws, the moral custom and, above all, the religious conscience of the individual prevail. If a man does not feel the joy and pride of being continued as an individual, as a family, and as a people; if a man does not feel, on the other hand, the sadness and the shame of dying as an individual, as a family, and as a people, then laws—and I would say especially Draconian laws—avail nothing. Laws must be employed as a stimulus to custom.[16]

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[15] Cf., in the same sense, C. Gini, in "Problemi della popolazione," *loc. cit.*, and in the interview on "La natalità e la potenza delle nazioni," given to *Il Popolo di Roma*, January 29, 30, 1928.

[16] Cf. the above-quoted Preface to the pamphlet of Dr. Korherr. This Preface has also been published in the review *Gerarrhia*, September, 1928, as a paper entitled "Il numero come Forza."

SOME NOTES ON BLACK'S *PRODUCTION ECONOMICS*

THE following notes are part of a review of *Production Economics* which was withheld from publication upon receipt of information that a revised edition was soon to be issued. However, some portions of the criticism retained considerable interest since several of the questions of economic theory with which they dealt were either treated briefly or omitted in the simplified *Production Organization*. A list of errors in the charts is included for the convenience of those who have occasion to use the original, unabridged edition.

The inadequacy of the theory of comparative advantage in dealing with complicated problems of specialization is readily suggested by the discussion in chapter v. Strictly only two products in two countries can be dealt with at one time, and more products and countries can be brought into the picture only by successive comparisons. But when this is done, inevitably some product, x, in some country, A, is intermediate in advantage between products y and z when comparison is made with country B, or x in A is at a comparative advantage over y as regards country B but not as regards country C. This is well illustrated by the difficulties in Case VIII,[1] page 144, involving five coun-

CASE VIII

AMOUNTS OF VARIOUS COMMODITIES WHICH CAN BE PRODUCED PER COMPOSITE UNIT OF THE ELEMENTS OF PRODUCTION EMPLOYED IN THE VARIOUS COUNTRIES

COMMODITIES	COUNTRIES				
	A	B	C	D	E
Wheat	24	25	20	40	5
Corn	10	30	22	5	2
Oats	15	28	18	30	8
Coal	18	15	28	5	10
Iron	5	14	30	5	9
Cloth	16	18	25	10	10
Shoes	14	16	26	9	8

[1] Although the use of constant costs in the exposition of the theory of comparative advantage follows the orthodox practice, it leads to unreal conclusions. Neglecting barriers to trade and excepting coincidences in degrees of comparative advantage in two (or more) products, each country tends to export one product and import all other products. Realistic conditions are achieved only with the recognition of varying costs of production and sloping supply curves.

tries and seven products. It will be observed that the following relations all run counter to tendencies indicated in the text. Country B in this case has the greatest comparative advantage over C in oats (not in corn); when comparison is made with A, C has greater comparative advantage in corn than in coal, cloth, or shoes; finally, E when compared with A shows the greatest comparative advantage in iron and when compared with D the greatest comparative advantage in coal (not in cloth). From such a maze of conflicting comparative advantages relatively few restrictions on the possibilities of equilibrium can be derived. The "Law of First Choice"[2] is not of great assistance, lacking as it does definition of the critical terms "limited" and "relative." In fact, an adequate description of the general conditions of specialization and exchange is obtainable only by bringing both supply and demand into the solution simultaneously as clearly defined factors. This the author could not do without expanding *Production Economics* to include value theory and particularly demand in relation to value.

Chapter xi, entitled "The Principle of Diminishing Outputs," and chapter xii, "The Principle of Diminishing and Increasing Economic Inputs," are important additions to the literature of economics. The cases, especially those involving two varying elements, are helpful in visualizing the relations between the quantity of product and the quantities of the factors of production. It is to be regretted that this two-variable case was not also set up in terms of additional costs per unit of output and made the basis for identifying the highest profit combination. The main defect of chapter xii, in fact, is the failure to emphasize adequately the concepts of additional product and additional costs.

The terminology "inputs" and "outputs" is good. But the transition in the x scale from inputs to outputs in Figures XXI and XXII, pages 336 and 337, should be called sharply to the attention of the reader. And the dangers of habitually using inputs as the x variable are well illustrated by Figure XXIV, page 341; Figure XLVIII, page 543; and Figure XLIX, page 545, wherein the author uses a rectangle to represent profits whose two dimensions are profit per unit of output and number of units of input! Nor does the error appear to be one of mislabeling the x variable, for, if it be changed to units of output, the rectangles in the charts are not those of maximum area which characterize the highest profit combination, at least in the last two figures cited.

[2] "Any product for which only a limited amount of suitable land is available, relative to the demand for it, will have first choice of this area" (p. 147).

If the exposition of the principles of inputs and outputs is extraordinarily good, their projection into chapter xiii, "Individual Differences and Their Combination," is extraordinarily bad. Here productivity is vaguely defined as the "power to contribute to the product," with the implication in the context that it is theoretically possible to segregate the portions of the total product contributed by each factor. It is further suggested that this "power to contribute to the product" can sometimes be measured statistically for each input element. Now if the productivity function were of the type

$$P=f_1(x_1)+f_2(x_2)+f_3(x_3)+\ldots. \qquad (1)$$

in which P is the total quantity of the product and x_1, x_2, x_3, etc., are the total quantities of the respective factors in the combination, the concept would have meaning. In this imaginary case the contributions to the product by each factor would be entirely separate and independent of the amounts of the other factors in the combination. But Professor Black, in his discussion on page 306, has taken pains to point out that the elements do not affect the product independently but jointly. In other words, productivity functions are of the type

$$P=f(x_1, x_2, x_3, \ldots.) \qquad (2)$$

in which $f(x_1, x_2, x_3, \ldots.)$ cannot be broken up into separate members, each involving only one factor.

Nor does the process of imputation based on marginal productivity lead to a determination of the total contribution of each factor.[8] We may in a causal sense impute to a unit of an input element the increment in the output secured by the addition of such a unit to the combination. Furthermore, in a competitive system any unit of a factor will be paid the value of its incremental or marginal product. Thus the share of the value of the total product which each kind of factor is able to secure may be ascertained. But it is not correct to take the marginal product multiplied by the number of units of the input element as the portion of the total product contributed by or, in a causal sense, attributable to the total quantity of that element. Such a process would be valid only for the imaginary type of productivity function in equation (1); for actual productivity functions indicated by equation (2) the process would be erroneous. Although the marginal product may be imputed causally to the marginal unit of a factor and although any unit

[8] This line of argument is adopted in *Production Organization*, chap. v.

may be marginal, such causal imputation does not apply successively or additively, but only to one unit which happens to be regarded as marginal.[4]

Productivity is next equated to capacity times efficiency, i.e., input times "net output" per unit of input. Evidently the author does not realize that his economic efficiency (which he neglects to define), measured at the highest profit combination, cannot be other than additional or marginal product, if it is to mean anything at all.

Not only does the author fail to explain "net output" per unit of input, but he then proceeds to introduce "physical efficiency" without definition. From the context one would gather that physical efficiency, alias gross efficiency, was simply average physical output per unit of input. But when the term is used without a modifier in an involved discussion what shall the poor reader do?[5] Why this proliferation of terms when the concept has already been better defined under another name?

Now let us examine the thesis for which this terminology was invented. Briefly stated it is this: "Gross products and the products of fixed elements rank the same." Evidently the case of a 1,000-horse-power engine whose fuel cost (under equilibrium conditions) is equal to the value of its power as compared with a 10-horse-power engine whose fuel cost is much less than the value of the power it produces did not occur to the writer. The large engine with a large gross product has a zero net product, but the small engine with a smaller gross product has an appreciable net product. Gross and net products do not necessarily rank alike. In his argument Professor Black failed to recognize that net efficiency (i.e., marginal productivity or residual productivity) may be lower when capacity is larger.

The chart on page 358 used to demonstrate this theorem is also in error on another point.[6] In this figure $BXYD$ represents the "contribution to the product" of nine units of fertilizer in the combination with Tract I, and $B'X'Y'D'$ the "contribution to the product" of ten units of fertilizer in the combination with Tract II. Now at the highest profit combination the cost rates for the inputs must reflect their "con-

[4] It is assumed that a unit of a factor of production is small in proportion to the total quantity of that factor in the combination.

[5] Pp. 361, 362.

[6] Cf. with Fig. XXVI, p. 352. In this figure let D' be the foot of the perpendicular dropped from Y'. The meaning of the rectangles $BXYD$ and $B'X'Y'D'$ is not clear. If YD and $Y'D'$ were to represent marginal productivities they would not of course ordinarily be equal when the average output per unit of input was a maximum.

tributions to the product."[7] Since the fertilizer is of the same grade in each case the two cost rates must be identical. But the per unit "contributions to the product," YD and $Y'D'$, are not equal! If YD and $Y'D'$ had only been defined as the marginal products of the fertilizer (which they must be if there is to be any sense in the demonstration), then it would have been obvious that at the highest profit combination these two marginal productivities would have to be equal.

In short, this whole treatment of the subject of productivity is unsatisfactory in terminology and in methods of analysis. Here was a chance to use and clarify the methods of chapter xii; instead they were abandoned for an inferior and confusing method of attack. In view of their significance in price theory it is most unfortunate that the concepts of marginal product and marginal cost were not dwelt upon and that the differential and residual methods of arriving at productivity were not adequately developed.

The proposition next suggested, relative to the combination of efficiencies, that factors of high efficiency (meaning supposedly high marginal productivity) tend to combine, will probably appeal to the reader as reasonable in spite of the unsatisfactory argument. If x is the "efficiency" of a store location and y is the efficiency of a storekeeper, why should xy be the product? Efficiency is expressed in terms of output ("net" or gross) per unit of input; the dimensions obtained by multiplying two efficiencies are certainly not the dimensions of output. Although the processes involved in the interactions of the factors are not those of a simple multiplication, it would have been possible to develop a suggestive illustration with results similar to those in the text, avoiding, however, the glaring difficulty just noted.[8] But, when all is said, this sort of reasoning involves a *non sequitur* in predicting the interaction of two high-grade factors from the interactions of a low- and a high-grade factor. The problem, as the author suggests, is to be solved by observation rather than by a priori reasoning.

In many of the charts the failure to indicate the variables plotted, the ambiguous or erroneous description of the variables, and the incorrect construction are, to put it mildly, irritating. If each figure were made more nearly a self-explanatory unit with a full title and a complete description of the variables plotted on each axis much improve-

[7] P. 353. The ordinary statement would be that the cost of a unit of a factor must equal the value of its marginal product under equilibrium conditions.

[8] Let A = quantity of a first factor, B = quantity of a second factor; the subscripts 0 and 1 indicate a lower and a higher grade of each factor, respectively;

ment would result. A list of the more important errors and omissions coming to the attention of the writer is given in a footnote.[9] These are so numerous that the author would do well to prepare a compilation of errata to accompany the book.

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x = the marginal productivity of A_0 when combined with B_0; y = the marginal productivity of B_0 when combined with A_0.

In the following table, which is only to be taken as a suggestion, let it be assumed that the first three cases are true. It would then appear to be reasonable to expect the fourth case to follow approximately in many instances.

Cases	Factors Combined	Marginal Productivity of A in the Combination	Marginal Productivity of B in the Combination	Total Product of the Combination
I	A_0B_0	x	y	P_m
II	A_1B_0	$x+1$	$\frac{(x+1)}{x}y$	$\frac{(x+1)}{x}P_m$
III	A_0B_1	$\frac{(y+1)}{y}x$	$y+1$	$\frac{(y+1)}{y}P_m$
IV	A_1B_1	$\frac{(y+1)}{y}(x+1)$	$\frac{(x+1)}{x}(y+1)$	$\frac{(x+1)}{x}\frac{(y+1)}{y}P_m$

It should be observed that this table assumes that one marginal productivity is affected proportionately by changes in the other marginal productivity. The theorem that high-grade factors tend to combine would, however, be established if an increase in x brought about any increase in y, and vice versa, whether or not this increase were proportionate.

[9] The items discussed in this paper are marked*.

P. 278 ff.; Figs. III, IV, V, VI, VIII: The smoothed cumulative or total-output curve should pass approximately through the upper right-hand corners of the rectangles instead of through the middle of the tops of the rectangles. In Figs. III and IV the scale should be shifted one-half an interval to the right to be correctly located with reference to the marginal and average-product rectangles and curves.

P. 319; Fig. XVI: The x variable is not labeled.

*P. 341; Fig. XXIV: When dealing with profit rectangles whose height is profit per unit of output the x variable must be output.

P. 349; Fig. XXV: The x and y variables are not labeled.

*P. 352; Fig. XXVI: The x and y variables are not labeled. Whether any significance attaches to the splitting of the productivity rectangles is very doubtful.

*P. 358; Fig. XXVII: This is an erroneous demonstration. YD and $Y'D'$ must be of the same height.

*P. 543; Fig. XLVIII: The x variable is incorrect and if it is changed to output the chart is incorrectly drawn.

*P. 545; Fig. XLIX: The error is the same as in the preceding figure.

P. 546; Fig. L: The y variable is not labeled. The x variable is not clearly de-

These notes do not constitute a complete review of *Production Economics;* much that is excellent in the book has gone unmentioned. An appraisal of the simplified edition, *Production Organization,* appears in the review section of this *Journal.*

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fined. If the rectangle $PM''N''O''$ is to be a profit rectangle and if $M''P$ is profit per dollar of cost, $M''N''$, and hence the x scale must indicate total cost (total economic input). On this basis both the scale and the description of the variable seem to be incorrect. Surely the "capacity" of management is not measurable in "output per dollar of cost."

P. 546; Fig. LI: The x and y scales are not entirely clear. The rectangle for (1*a*) below the zero line does not agree with Fig. L or Table XXIII, p. 548.

P. 553; Fig. LIV: The x scale is incorrectly labeled. The facts could have been shown more clearly by two component-part bar diagrams.

P. 561; Fig. LVI: What is the y variable? Is it total net profit?

P. 564; Fig. LVII: Are these two curves representative of additional costs and receipts per unit of input? If so, the former should be a straight horizontal line. The area under these curves would then represent total costs and total receipts, respectively. But a rectangle whose dimensions are number of units of input and additional receipts per unit of input would not represent total receipts.

PRODUCTION IN MASSACHUSETTS MANUFACTURING, 1890–1928

THE Massachusetts statistics of manufactures provide an opportunity for testing further the theory of production advanced by Professor Paul H. Douglas and myself in a former paper,[1] wherein a function of labor and capital alone was found to approximate production for the United States from 1899 to 1922, from which certain trend relations between production, labor, and capital could be theoretically deduced. This function was of the form (except for a numerical factor)

$$P = L^a C^b \; ; \quad a+b=1 \; . \tag{1}$$

P=Production; L=Labor; C=Capital.

Since it remained quite uncertain whether similar results could be obtained from similar data, index numbers were prepared to represent Massachusetts manufacturing and in turn six of the principal industries of Massachusetts, the data being given yearly. In attempting to fit equations of the form (1) to these different sets of data, difficulties were encountered which I discussed (through his courtesy) with Dr. Ragnar Frisch.

To obviate these difficulties Dr. Frisch suggested that the restriction $a+b=1$ in equation (1) be removed, making it possible to find not only the ratio a/b (in which I was particularly interested) but also the sum $a+b$ (elasticity of the product to both labor and capital), the new equation still including the old as a special case, and appearing now in the form (except for a numerical factor)

$$P=L^a C^b \; ; \quad (\log P=a \log L+b \log C) \; . \tag{2}$$

In this equation values of a, b, $a+b$ were fixed by Dr. Frisch's diagonal mean regression[2] for the different industries of Massachusetts for the periods (1) 1890–1909, (2) 1890–1919, (3) 1890–1928 as in Table I.

[1] C. W. Cobb and P. H. Douglas, "A Theory of Production," *Amer. Econ. Rev., Supp.*, March, 1928.

[2] Ragnar Frisch, "Correlation and Scatter in Statistical Variables," *Nord. Statist. Jour.*, VIII (1929), 74. This regression formula seemed particularly well adapted to the present study.

If we should keep the restriction $a+b=1$, the resulting values of a and b would be nearly proportional to the foregoing under "favorable

TABLE I

VALUES OF a, b, $a+b$ CHOSEN TO FIT EQUATION (2), $P=L^a C^b$ TO THE INDICES OF PRODUCT, LABOR, AND CAPITAL* FOR CERTAIN MASSACHUSETTS INDUSTRIES

	a	b	$a+b$
PERIOD I, 1890–1909			
All Mass. industries	+1.26	−0.32	+0.94
Boots and shoes	1.55	− .30	1.25
Cotton goods	1.66	+ .48	2.14
Woolen and worsted goods	1.57	−0.10	1.47
Paper	3.03	+2.14	5.17
Leather	2.45	−0.71	1.74
Metal products	+0.98	+0.93	+1.91
PERIOD II, 1890–1919			
All Mass. industries	+1.20	+0.23	+1.43
Boots and shoes	1.41	− .19	1.22
Cotton goods	1.82	− .28	1.54
Woolen and worsted goods	1.41	− .20	1.21
Paper	2.45	+ .70	3.15
Leather	2.54	− .88	1.66
Metal products	+0.82	+0.63	+1.45
PERIOD III, 1890–1928			
All Mass. industries	+0.95	+0.48	+1.43
Boots and shoes	1.42	− .17	1.25
Cotton goods	1.34	+ .21	1.55
Woolen and worsted goods	1.35	+ .17	1.52
Paper	2.02	+ .58	2.60
Leather	2.24	− .72	1.42
Metal products	+0.72	+0.74	+1.46

* Product means value product in constant dollars; labor means average number of laborers; capital is used in the sense of the Massachusetts statistics and is reduced to constant dollars.

The data on which the Table is based are omitted here as it is hoped to publish them in another connection. The treatment of the data has been the same for all industries.

conditions," for example, in the boot and shoe industry where $a+b$ is not large relative to unity and does not change rapidly. On the other hand, with "unfavorable conditions," say in the paper industry from 1890 to 1906, we might reach the conclusion that labor is infinitely productive and capital infinitely destructive, or the other way around, as you wish.

The results of the United States study made with Professor Douglas remain practically unchanged as far as the ratio a/b is concerned. When the present technique is applied to the data given therein, a and b are found to be proportional to 77 and 23, respectively, and they were originally given as proportional to 75 and 25. The sum $a+b$, however, comes out equal to 2.11, $a=1.63$, $b=.48$.

In case either a or b is found to be negative for a given period the industry may be supposed to be (temporarily) overmanned or overcapitalized in the sense that a reduction in one of these factors would lead to an increase in product if the other factor remained unchanged. In case, as sometimes happens for a given period, both exponents come out negative, the industry may be supposed to be (temporarily) both overmanned and overcapitalized in the foregoing sense.

My thanks are due Dr. Frisch for his criticisms and Mr. Roswell F. Phelps, the State House, Boston, for assistance in securing relevant data.

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BOOK REVIEWS

The Assignats. By S. E. Harris. Cambridge: Harvard University Press, 1930. Pp. xix+293. $3.50.

Material connected with the financing of the revolutionary period in France is now fairly adequate, and a great deal has been made available during the last twenty years. It has remained for Dr. Harris to make a new and complete analysis of the assignat episode, using data denied to previous investigators, and to place the problems in the setting of modern monetary theory. This, the latest of the "Harvard Economic Studies," is concerned, then, with two tasks: first, an appraisal of the data around which subsequent discussion must revolve; and second, a re-examination of the forces at work contributing to the depreciation and abandonment of the paper currency. The result is a painstaking piece of research, bringing to light much that will invalidate popularly held conceptions as to the correlation between the increase in the circulation of the assignat and its depreciation, followed by an acute analysis, well sustained, of the influences to which the value of the paper money was subjected during its brief existence.

In the first place, a comprehensive study of the government finances reveals the fact, not generally recognized, that taxation provided a by no means insignificant portion of the revenue during the early years of the Revolution, and supports the author's conclusion that the successive emissions of assignats were governed by the deficiencies in the treasury, and cannot, therefore, be considered as a procedure deliberately adopted to insure the destruction of class and privilege. Incidentally, the calculation of the actual circulation is approached afresh; the author distinguishes carefully between decrees of emission and of creation before making an estimate of circulation—the distinction, of course, being very important.

Chapter iii discusses the concept that the value of the assignat was maintained by the existence of the *domaines nationaux* against which security it was issued and the sales of which it was intended to facilitate. That public confidence in the currency is the prerequisite for relative stability of value is sufficiently true, as the creators of the assignat (and of the Rentenmark) realized. The decision to issue in small denominations is evidence of the real purpose for which the cur-

rency was intended; the marked agreement between emissions and the monthly deficits in the treasury supplies even stronger proof. Nevertheless, the element of confidence that the land sales would absorb redundant supplies of currency persisted for several years, and, as the author demonstrates, helped to sustain the value of the assignat. When land sales declined—and the system of price control in the subsistence market was partly responsible—the land fallacy became apparent.

Considerable attention is given to the perplexities involved in shaping a suitable yardstick of depreciation. Any index which fails to include the price of foodstuffs, thereby ignoring the effect of the system of price control, is worthless. Prices of gold and silver, heavily weighted in the government tables of depreciation, do not provide a satisfactory measure of internal depreciation at a time when the bullion market itself was artificially restricted and controlled. By this method of approach, the author makes it clear that the depreciation was proportionately less than the increase in circulation, as indeed one would expect if the price of land and the artificially depressed foodstuff values dominate the new index, and concludes that the *taxe* had the effect of sustaining the value of the assignat which circulated. This, of course, is not strictly correct. The result of the increased circulation would be seen in the rising prices of non-controlled or imported articles and reflected in the price of foreign exchange. At all events, when the failure of the "maximum" forced its abandonment in 1795, the prices of commodities hitherto controlled rose to their natural level.

Perhaps the most interesting chapter is that which analyzes, by periods, the causes of depreciation, before and after the Terror. That the quantity theory in its rigid and static form proves unequal to the task is to be expected. The author discusses the factors influencing the demand for and the supply of assignats—rationing and requisition in the subsistence market, taxation, political and military fortunes—and demonstrates, if indeed the fact needs demonstration today, the futility of discussing the quantity theory in terms of but one, though that the most prominent, factor in the equation.

Further chapters deal with the effects of depreciation upon contracts, with the failure to allow food prices to rise and create their own corrective in further land sales and increase production, with the problems which arose from a depreciating exchange, and concludes, somewhat summarily, with a brief discussion of the difficulties of revalorization and return to a stable standard.

It will be realized, then, that this is an acute study of a fascinating period in monetary history; the complete documentation and ample bibliography indicate the care with which it has been undertaken.

J. F. PARKINSON

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A History of the English Corn Laws 1660–1846. By DONALD GROVE BARNES. London School of Economics Studies in Economic and Social History. New York: F. S. Crofts & Co., 1930. Pp. xv+336. $5.00.

This is a most excellent monograph, scholarly, comprehensive, well-documented, and interestingly written, and is an important contribution of the sort badly needed if it is to become possible for anyone to write the as yet non-existent history of English commercial policy. It falls somewhat short, however, of what its title proclaims it to be. It is more a history of English public opinion with respect to the corn laws than an economic history of the corn laws themselves, their mode of operation, and their economic effects, although some contribution is made also to these phases. The period before 1750, moreover, is covered only sketchily, with great reliance on secondary sources, and with little evidence of first-hand research. For the period 1750–1846, however, it is admirable in the thoroughness with which it covers the discussion in Parliament and in the tracts of the corn laws and the grain situation in general, and becomes indisputably the standard work on this subject.

For the sketchy treatment of the earlier period, the justification is offered that there was little interest during this period in the corn laws, and that little or no reference to them is to be found in the contemporary literature. Thorold Rogers once remarked similarly that the corn bounty law of 1689 aroused almost no contemporary comment, and it does seem that the special literature on the corn laws is extremely scanty before 1750. Nevertheless, there is some literature which the author has overlooked. John Houghton discussed the corn bounty of 1673, which was overlooked by modern writers until Gras rediscovered it. Brewster, Dobbs, and Decker, all writing before 1750, discussed the 1689 corn law. Although I have not seen it, I believe that the anonymous pamphlet, *An Appeal to All True Englishmen, or a Cry for*

Bread, 1695, contains an attack on the 1689 law. The author has overlooked, also, the important historical articles by Cornelius Walford, in the *Journal of the Royal Statistical Society* for 1879, on "The Famines of the World," and especially his bibliography for the early period.

For the period after 1750, it is more difficult to find important gaps in the author's really impressive bibliography. Really important items which seem to have escaped his notice, however, are the discussions of the corn laws by Malthus in the early editions of his *Essay on Population* and by Dugald Stewart in his *Lectures on Political Economy*, published posthumously. The latter, incidentally, is one nineteenth-century writer who was aware of the 1673 export bounty.

Most modern accounts of the agitation leading up to the repeal of the corn laws in 1846 and the triumph of free trade have been written by sympathizers with the movement who picture the anti-corn-law leaguers as the heroes and their opponents as the villains of the drama. The author succeeds in demonstrating that there were bad manners and bad reasoning on both sides, but the two cases which he cites (p. 255) of defenders of the corn laws being interrupted by free traders seem negligible as compared to the systematic campaign of interruption and even violence which the anti-corn-law speakers had to face if the hitherto standard accounts are to be believed. It is perhaps permissible also to say a word in defense of Cobden's failure to show appreciation of Peel's tariff reforms of 1842. It has never been clear whether Peel introduced these reforms as a friend of protection or as its foe, in the hope that strategic concessions to its enemies would undermine the force of the attacks being made on the protective system. As Schuyler has shown, Peel in 1842 attempted also to strengthen the hold of protection on public opinion by tying it up with Colonial preference, and thus winning for it the support of those who, to use a term still to become common usage in this sense, were imperialistically-minded. Perhaps Cobden realized this. Whether or not Professor Barnes's interpretation of the situation could withstand scrutiny on all points, it is a well-proportioned and enlightening account of that most famous of all tariff controversies, and adds substantially to the previously available histories.

On the side of economic appraisal of the corn laws, the study makes no contribution of value beyond providing the historical setting. The author reveals no sign of recognition of the problems involved in judging the desirability of a particular item of economic legislation. With respect to the second export bounty, for instance, he says: "Clearly

the period was over [after 1765] in which the bounty was needed to stimulate the production of grain," and gives as evidence the cessation of an export surplus because of the growth of the home market. How would he demonstrate even for the earlier period that there was economic justification for diverting English productive resources, by means of a subsidy from the national treasury, from the occupations in which they would otherwise have been applied to the production of grain for export? He says for the bounty during the early period that it "helped to find a market for this surplus" of grain. The problem was not so much one of finding a market as of the existence, due to the bounty, of more grain than could be profitably marketed without subsidy.

A technical phase of the English corn laws, which still warrants competent investigation because it was the only experiment on a large scale with this device, is the efficacy of the sliding-scale duty as a price-stabilizing device. The authorities are agreed that the corn laws failed disastrously to achieve their objective of preventing great fluctuations in price. But they usually fail to consider to what extent this was due to faults in the legislation and to inefficient and disloyal administration and not to the inherent impossibility, under any conditions, of stabilizing price by sliding-scale duties. In any case, the improved, though still imperfect act of 1842, appears to have stabilized the price of wheat to a degree which was almost too good to be true. On this phase of the corn laws, and especially the defects of administration, this study throws some valuable light. But the definitive analysis of the effect of the sliding-scale duties on the stability of English grain prices still remains to be done. What has been done which is of any value is the work of German scholars.

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The Economic Development of Post-War France. By WILLIAM F. OGBURN AND WILLIAM JAFFÉ. New York: Columbia University Press, 1929. Pp. xii+613. $6.00.

This is Volume III of the series on "Social and Economic Studies of Post-War France" edited by Professor C. J. H. Hayes and prepared under the auspices of the Columbia University Council for Research in the Social Sciences. The work is primarily a survey of post-war produc-

tion in France and admirably maintains the high standard set by Professors Haig and Rogers in the earlier volumes.

Part I, broadly descriptive of France's new acquisitions of economic power through annexation, new mechanical equipment, and changed economic relationships, develops into an inductive search into the nature of the temporary phenomena borne of inflation and deflation and their effects upon industry. Thus the authors resolve the numerous apparent paradoxes which have characterized post-war French economic life. The analysis of the factors which distinguished the economic *bouleversements* of France after the war and of their effect upon trade and production (chapters vi and vii) constitutes one of the most suggestive case studies in post-war economics.

Part II consists of "a series of monographic studies of French mines, key industries, agriculture, foreign trade, and combination tendencies." The panorama of French industry is punctuated by pertinent digressions into the technical aspects of hydro-electric development and chemical processes. Extensive data derived from French sources permit the delineation of certain underlying movements in French industry whose interpretation has hitherto been derived from a priori generalizations. The frequent but inevitable disparity in statistics and the inability of the authors to carry their comparative studies beyond the early days of de facto stabilization are, of course, limiting factors which tend at times to dim one's perspective. Yet the movements of industry are clear. It is apparent that the basic currents have changed neither force nor direction since the period, 1906–13. The fact that silk and rayon have forged ahead while cotton and woolen industries languish is not to be explained by any peculiar post-war phenomena. Hydro-electric development in the face of fleeing capital, and the world rôle assumed by the French metallurgical industries, are closely interrelated in the greater need for power. Export indexes are plainly shifting in favor of manufactured goods. Productive agricultural areas have shrunk even though the rising prices of imported foodstuffs during inflation would be expected to keep the price of domestic products at a level high enough to stimulate farm production. Nevertheless the forces underlying the course of French industry are deeply rooted and are discernible in pre-war statistics. They have been much less subservient to monetary influences than has been generally assumed by post-war economists. France's new sources of power have undoubtedly speeded up her industrial processes but those whose emotions have been stirred by the surface oscillations, induced by a gyrating franc,

and who see post-war France as the product of a "second industrial revolution" will do well to follow Professors Ogburn and Jaffé in their less dramatic but more convincing rôle.

To the many who hold with Moulton and Anderson that bank credit, however derived, constitutes a real source of capital the discussion on pages 78–80 lacks certain essential differentiations. An examination of exchange rates hardly supports the statement (p. 158) that the "gold value of the franc" fell sharply after February, 1924, as did prices and the "discrepancy in favor of foreign moneys." The excellent chapter (iv) on capital supply could have been given an added significance had the authors availed themselves at the last minute of the appearance of the special annual issue of the *Revue d'Économie politique*, March–April, 1929, in order to give wider range to the valuable statistical tables on savings and security issues by the inclusion of the years 1927 and 1928 whose figures are particularly interesting. Such observations, however, only place in bolder relief the excellent qualities of a book whose array of quantitative data does not detract from its readableness and whose lucidity and style make the volume as fascinating as it is thorough. It is a welcome addition to the economic literature of post-war Europe available in the English language. The excellent bibliography is suggestive of the scope of the work.

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History of Illinois Labor Legislation. By EARL R. BECKNER. Chicago: University of Chicago Press, 1929. Pp. xiv+539. $4.00.

This volume is Number XIII of the Social Science Studies produced under the general direction of the Local Community Research Committee of the University of Chicago. In the Preface, Professor Beckner, the author, states that he has "attempted to give an accurate and unbiased account of the development of labor legislation in all of its forms in the State of Illinois." "The central problem," as he sees it, "is the discovery and interpretation of the forces and causes, both proximate and remote, which have molded the labor code into its present form. For the most part, the laws themselves are mere resultants of these forces and points of departure for further evolution."

In the main, the volume is historical in character and brings together in a remarkably effective manner the essential steps in the development of legislation pertaining to labor in one of the most important industrial states of the country. A very wide range of topics has been brought within the scope of the study. The volume is well annotated, indicating that the author has gone to source materials.

One of the chief merits of the book is the amount of detail that is given concerning the conditions surrounding the enactment of the various laws. This supplementary information not only aids the reader in understanding the particular acts, but gives confidence in the thoroughness of the investigation.

While the volume is a distinct contribution to the literature on labor legislation, there are, in the opinion of the reviewer, a number of minor criticisms that mar the excellence of the work. First, the author has not at all times adhered strictly to his standard of an "unbiased account." Referring to the Haymarket Riot the following passage may be found: "For several years after the unfortunate and apparently uncalled-for attack by the police upon a peaceable gathering in Haymarket Square, etc." (p. 13). Likewise, the summary and conclusions on pages 59–60 are an expression of the author's point of view, which, though generally speaking I would personally be inclined to accept, are nevertheless opinions on controversial questions concerning which honest men may hold widely different views. They are conclusions that do not flow solely from the historical evidence. Other examples of similar character appear when the author departs from the recital of what has transpired to an evaluation of legislative proposals or enactments. (Cf. especially statement concerning state insurance fund, p. 473; also comment on the majority report, State Health Commission, p. 485.)

In the second place, some evidence, taken from what would appear to be biased sources, seems to be accepted without verification. As an instance, the quotation from Lucy Parsons' *Life of Albert R. Parsons* (pp. 67–68). Again a quotation from State Federation Weekly News Letter concerning a statement by John M. Glenn, Secretary of Illinois Manufacturers' Association (p. 71).

In the third place, there is a certain amount of "preaching" mixed in with the historical treatment. This criticism is akin to the first one given above. Frequently the author departs from an explanation of what has transpired and the facts and forces pertaining to the action,

to a statement of what "should" have been done in the circumstances (cf. pp. 299, 396, 397, 425, 428).

A criticism of another character may be levied against the method of comparing the volume of business done by the private and public employment agencies. The statement is made that the private agencies make three or four times as many placements as the public agencies (p. 424). No statement is given of the number of private agencies in comparison with the number of public agencies. At the date used there were at least twenty private employment offices to one public office. If the purpose of the comparison was to show relative efficiency of the two types of agencies, then some common unit such as cost per placement, or relative number of registrations placed, or relative number of employers' orders filled, should have been used. Such a comparison will show, I am sure, that with all of their present faults, the public agencies are doing as good a job as the private agencies.

On page 404 the statement appears that the State Superintendent of Private Agencies had suggested in his annual report that private agencies be required to furnish the Department of Labor with monthly reports concerning the number of persons applying for positions, etc. This statement does appear in the annual report, but things are not always what they seem to be. Something over ten years' affiliation with the affairs of the Department of Labor enables me to say that beginning with 1921 the annual reports of most of the divisions of the Department of Labor were either actually prepared, or were carefully edited by the Director of Research, a fact that might not occur to the author unless he should have compared the character of the reports prior to this date with those subsequent to it.

The chapter on Administration and the one on Summary and Conclusions are not of equal merit with the previous part of the volume. No labor law is better than the administrative provisions, nor especially than the attitude of the administrative officers. This chapter could have been much stronger and still have been historical in character. The last chapter adds little and in the present form scarcely deserves the dignity of a separate division of the book.

Notwithstanding these defects, which are not relatively as serious as the space given to them in this review, the volume is one of real merit and will be of interest to all students of labor problems.

F. S. DEIBLER

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Income and Wages in the South. By CLARENCE HEER. Chapel Hill: University of North Carolina Press, 1930. Pp. ii+68. $1.00.

Critical study and writing in the social sciences, particularly as touching internal sectional affairs, came late in the South. When articles and books by Southerners examining the South objectively did begin to appear, they were naturally mainly qualitative in character. Data for quantitative treatment had not been gathered, and facilities for their collection are still insufficient. But a hopeful beginning in this direction has been made, as is evidenced by the present volume. The author makes it clear that this is a trial treatment, that he might have made it more complete by further study and, particularly, by waiting for the new census returns. Much has been gained and little lost by bringing out a preliminary study now. Mr. Heer, by analyzing the material to hand, has made an original contribution of importance; most of his conclusions are so inescapable that it is doubtful if further or later data would have changed the results materially. If this is a half-loaf, it is a sustaining one.

Some of Mr. Heer's outstanding summarizing statements are: The proportion of persons filing income tax returns is only one-third as great in the South as in the remainder of the country. Almost half of the southern population lives by farming, yet the gross value of farm products per adult male worker has averaged only a little over half the corresponding value for the rest of the country during the last twenty-eight years. The wages of casual farm laborers in the South average but 48 per cent of the wages paid elsewhere; non-casual farm laborers of the South received, in 1925, with prerequisites, 66 per cent of the corresponding wage elsewhere. A million and a half persons are gainfully employed in manufacturing and mechanical pursuits in the South, which is 18 per cent of the total working population. Between 1919 and 1927 the number of industrial wage earners increased in the South by 9 per cent, declining by the same percentage in the rest of the country. The average annual earnings of industrial workers in the South are about 40 per cent under the average in the rest of the country. Cotton mill workers in 1927 averaged 66.3 per cent of the wage elsewhere in the country. Generally, for all workers, the wage differential reaches the maximum in unskilled employments.

The reviewer is inclined to think that, in accounting for his results, Mr. Heer places too much emphasis upon the lower grade of skill required in southern industries but he is unquestionably correct in dwell-

ing upon the depressing effect on wages of the agricultural worker, particularly the Negro. But everything is tending toward betterment in an approach to national standards—industry is growing and the diminished agricultural population is learning more intelligent methods.

BROADUS MITCHELL

JOHNS HOPKINS UNIVERSITY

Scientific Management in American Industry. Edited by H. S. PERSON. New York: Harper & Bros., 1929. Pp. xix+479. $6.00. Textbook ed., $4.00

As compared with the Taylor, Gantt, and Gilbreth "classics," which were either for special audiences or treated special phases of management, and with those pre-war treatises which were arguments for the basic soundness of systems rather than expositions of technique, the present volume represents an attempt

> to give a perspective, a rounded-out picture of scientific management and further to have this largely a post-war characterization showing the adaptations suggested by this school of industrial thought and procedure in meeting the various situations which have confronted American industry since the Armistice.

Twenty-six persons representing a wide range of experience have collaborated with Dr. Harlow S. Person, managing director of the Taylor Society, in this undertaking.

The attempt to present a perspective is evidenced, first, in the variety of aspects and divisions of management treated and, second, in the historical and analytical presentation of Taylor's principles and in the effort, especially on the part of Dr. Person, to demonstrate a close relation between the principles of Taylor and the tenets of this present-day exposition. As regards scope, all aspects of management, with the notable exception of finance, are covered in considerable detail. The treatise is organized on the basis of three major elements in management: research, standards, and control through standards. The individual contributions are developed and organized around these elements, and a respectable degree of unity is thereby attained. Some of the papers are detailed, technical treatises of the manual type, whereas others are general and largely non-technical. Considered as a whole, the book may be characterized as in part historical, in part a manual of procedures, and in part an exposition of a point of view and philoso-

phy of management. In both scope and quality it is a notable collection of essays.

A treatise showing the adaptations suggested by this school of industrial thought and procedure in meeting the various situations which have confronted American industry since the Armistice surely merits critical examination. Undoubtedly it does represent, in most respects, the advanced thought and practice with respect to various aspects of management—which means that it portrays high spots rather than average or general attainment. As Dr. Person admits, there are distressingly few cases of complete installation; and, consequently, the essays deal largely with types of management found in particular departments rather than in enterprises considered as units.

In the exposition of methods of research, organization, and control, one finds ample evidence of adaptations in policies and practices which were designed to meet changed industrial conditions. Perhaps no evidence of these changes is more striking than the inclusion of chapters dealing with problems in the management of personnel. It is a far call from Taylor practices and theory to these chapters. The Taylor group of engineers, to be sure, has always prided itself on its readiness to accept and incorporate all progressive ideas and methods, and the essays, therefore, properly reflect the position of members of the group. It is unfortunate, however, if there be implication that the methods and policies outlined there are in any sense the special possessions of this group. Nothing specifically Taylorish is disclosed; the position represented is that of progressive management of whatever school.

Since its formal organization in 1919, the Taylor Society, though always a small group, has greatly advanced the cause of better management. Through conferences, publicity, and through the work of outstanding persons in the group, it has continuously rendered effective services of which this volume is worthily representative. Throughout, however, the organization has given a considerable amount of its energy and enthusiasm to the attempt to proselytize a resistant world with the esoteric cult of "scientific management." Mr. Cooke refers to the Society in its beginning as a small group of a dozen persons. The number was prophetic of the apostolic zeal to deify Frederick Taylor and to develop from his signal and revolutionary but, nevertheless, rather meager work, a doctrinaire system so vague as still to require elaborate exposition in 1929 and so elastic as to encompass all significant managerial developments during the past two decades. This zeal has afforded a bond of cohesion for this group of crusaders and has

been responsible for vigorous promotion of improvement in methods. At the same time, however, it has led to a rather wearisome exegesis of the contributions of Taylor and to attempts, sometimes ridiculous and usually questionable, to interpret subsequent developments in management as the logical developments of specific elements in the Taylor System. Taylor's system was of the machine-shop. Whereas he was developing methods of dealing with variability in particular tasks, the 1929 volume presents methods appropriate to the complexities of large-scale operations. Yet, budgeting is held to be the logical evolution from measurement and scheduling in the machine-shop; the development of constants in the human world through selection and training of persons and statistical estimates of mass movements, an evolution from the method of reducing variables to constants in the machine-shop; sales quotas, a direct descendant of differential piece rates; Taylor, the first industrial psychologist; etc. This sort of treatment too often confuses analogy with heredity.

Despite these heroic efforts to connect advanced managerial practices with the work of Frederick Taylor, and despite effort to justify the concept "scientific management," the phrase remains less happily descriptive of the content of these essays than of Taylor's methods and philosophy. Here is a comprehensive exposition of sound method in management; but a very special use of language must be granted to justify its being called "scientific."

R. W. STONE

UNIVERSITY OF CHICAGO

Foreign Securities. By JOHN T. MADDEN AND MARCUS NADLER. New York: Ronald Press Co., 1929. Pp. xiv+452. $6.00.

It is the main purpose of the book under review to contribute to a better understanding of the advantages of investments in foreign countries. The authors venture the prediction "that our foreign investments will largely increase as our bankers and, particularly our investors, realize more generally than is now the case that opportunities for sound and safe investments are not confined to domestic securities." But with the mounting tide of foreign issues absorbed in this country the danger of losses increases in case the public is not provided with infor-

mation on which to base its judgment regarding the original purchase and the subsequent sale or exchange of securities.

"Mr. Thomas W. Lamont, when serving as chairman of the Foreign Securities Committee of the Investment Bankers Association of America, gave expression to views which later crystallized into the organization of the Institute of International Finance, a joint undertaking of the Investment Bankers Association and New York University for the study of credit conditions abroad and for the analysis of the major problems of international finance from the viewpoint of the American banker and investor." The authors are directors of the Institute and thus well equipped for their study.

Part I of the book bears the heading "Theory of International Finance" and attempts to give this theory in forty-three pages. There are three chapters, the second one giving the rate structure of the money markets in New York, London, Berlin, Amsterdam, and Paris. This material is very useful for the student comparing movements of interest rates on the different countries and thus provides some much-needed information but it hardly contains what may be called theory. The first and third chapters deal with the international money and capital markets. "The chief function of the international money market is the distribution of the surplus of unused short-term funds among the various national markets" . . . . while the function of the international capital market is "the distribution of long-term funds from capital-rich countries, where the rates for long-term capital are low, to capital-poor countries, where the rates are high."

The authors' theory is given in these words and undoubtedly is fundamentally sound. But how do they explain that it often seems to be easier to raise European capital for American ventures than American capital for European ones? German investors were willing to invest in European Ford factories and in American subsidiaries of German rayon manufacturers at rates that were incomparably lower than those that first-class concerns like Siemens & Halske had to pay in order to obtain American capital. Or what explanation could the authors give for the fact, that in Switzerland capital is abundant at say 3 per cent while Austrian industries, just across the border, have to liquidate on account of lack of working capital? Somary in his *Wandlungen der Weltwirtschaft seit dem Kriege* (pp. 56) quotes the Bible to explain this phenomenon: "To him that hath, shall be given."

Part II discusses in a comprehensive way the "Analytical factors of

public securities." Methods of underwriting foreign government loans, negotiations of foreign governments with American bankers and the factors to be considered as criteria for the safety of such loans are explained with an authority that the authors owe to their close contacts with our international banking houses.

Part III deals with "Political and legal factors," like internal and external foreign loan control, repudiation, default, gold clause, and financial intervention. This part appears to the reviewer to be the best one of the book; real pioneer work has been done in compiling the recent material.

Part IV "contains an introduction to the subject of mortgage banking, followed by chapters on mortgage banks operating on a co-operative basis, mortgage banks owned and controlled by the governments, and special mortgage banks."

The reader misses a discussion of private corporation securities of which the authors say "that they are in a class by themselves and should be treated in a separate work." The reader misses furthermore —and no explanation is given by the authors for this fact—information on whether or not the business cycle in this country and in foreign nations goes parallel or whether a depression here may coincide with European prosperity or whether there may be no relation at all. Do the bond and stock markets in the different countries show parallel tendencies or not?

The reviewer believes that the interest of American investors in foreign securities will in the future shift from government issues to private issues and from the purchase of new issues to the investment in seasoned foreign stocks, for the purpose of diversification. The investment trusts are the pioneers in this field or should at least have been. Much work remains therefore to be done to attack such interesting problems as how far, if at all, American, Canadian, or European stocks move parallel with the general trend of their respective stock markets or move parallel with all stocks in the same industries in the different countries. The year 1928 showed a parallel trend in the copper, rubber, electrical equipment, and public utility shares in all countries; automobile shares, however, moved quite differently. Since the international economic relations are becoming closer every day, the economist faces new tasks.

ROBERT WEIDENHAMMER

UNIVERSITY OF MINNESOTA

General Sales or Turnover Taxation. By the NATIONAL INDUSTRIAL CONFERENCE BOARD. New York: National Industrial Conference Board, Inc., 1929. Pp. xv+204.

With the publication of this study there is at last available in English an adequate comparative and historical account of sales or turnover taxes in the modern period. In view of the seriousness of the gap in fiscal literature, a defect which was increasingly troublesome as treatises on the subject continued to appear in foreign countries but were not translated into English, the decision of the National Industrial Conference Board to include a volume on the sales tax in its "Studies in Taxation and Public Finance" adds greatly to the value of the series.

In the course of the last decade general sales or turnover taxes—the two expressions are here described as synonymous and applicable to all taxes based on the sale, exchange, or transfer of commodities, properties, or services—have become a major element in the tax systems of all the important European powers except Great Britain. In the United States, since the failure of the movement from 1918 to 1921 for a federal turnover tax, the question has been a dead issue. The authors of this volume believe, however, that the states, and possibly the cities, assured of the practicability of the tax by the experience of West Virginia, and with due allowance for the social distribution of its general burden, may turn in growing numbers to the sales tax as a fresh source of revenue.

The greater part of the volume is given to the constitutional, economic, and administrative difficulties which federal and other sales taxes might meet in the United States. The revenue aspects of the taxes in the forms in which they are now utilized abroad is left for the most part to an Appendix, although the first chapter includes a vigorously executed chart showing the maximum yield of the tax in five foreign countries and the state of West Virginia. These yields range from one-fifth to one-third of total tax collections for the year.

The constitutional difficulties anticipated for sales taxes are not believed to be serious. The general sales or turnover tax is described as being one of the taxes which may be levied by the federal government, or by state or local governments, or by both concurrently. The economic difficulties which a federal tax may be expected to meet include the increase by the amount of the tax of most prices paid by consumers, and the discrimination against independent-process concerns which a multiple-turnover tax would bring. From the administrative point of

view, a general turnover tax with a uniform rate would be the least difficult of all forms of federal turnover taxes.

As for state and local sales taxes, the requirements of the federal constitution might be met by levying the tax on the transfer of title of the goods sold, and measuring the amount of the tax by the value of the goods at the time of this transfer of title. Most state constitutions present no bar to the levy of such a tax.

The analysis is not profound, and the study suffers somewhat from the abstract character of the treatment. The social unrest caused by the French turnover tax, for example, and the political difficulties caused by it, might well have been described. It is unusual to find so great a tolerance toward general consumption taxes as the authors reveal, especially when the taxes are under discussion in the fiscally advanced Anglo-Saxon countries.

ALZADA COMSTOCK

MOUNT HOLYOKE COLLEGE

Select Documents in Canadian Economic History, 1497–1783. By H. A. INNIS. Toronto: University of Toronto Press, 1929. Pp. xxxiv+581. $4.00.

The economic history of Canada is, as Professor Innis says in his Preface, "for the most part an uncharted sea." All students of the subject are consequently greatly indebted to him for this comprehensive and carefully edited selection of documents.

The present volume is but an instalment in a plan which, when complete, will cover the whole period of Canadian economic history, except those parts already covered by Dr. Adam Shortt's volumes on Canadian currency and finance. The documents here selected cease with the year 1783, a boundary mark much more definite in economic history than the conventional 1760 or 1763, the end of French political control. Many of the economic problems of French colonization in Canada can be most advantageously studied in the period from 1760 to 1783 when it is possible to contrast British and French policies applied to the same colony. In 1783 also ends the brief period when there was freedom of trade and migration between the St. Lawrence Valley and the American colonies. The influx of Loyalists and others in the succeeding decades to the areas west of Montreal started a new period in Canadian settlement and industry.

The majority of the documents here reproduced are taken from the transcripts of the Public Archives at Ottawa, and are largely composed of official correspondence, reports, and memorandums. Some business papers have been included, but such are lamentably scarce in this period. Extracts from the *Quebec Gazette* appear in the later pages, while numerous extracts from the works of contemporary historians, travelers, and pamphleteers run throughout the collection.

The book is divided into two parts, "The Fishing Industry" and "The Fur Trade." The first part deals with the history of the maritime settlements, while the latter embraces the St. Lawrence Valley and inland settlements. These were the basic industries which formed the foci for the economic activities of the regions. While the documents in the first part are comprehensive in scope, there are omitted from the second part documents bearing directly on the fur trade and on seigneurial tenure. For these, the student is referred to Professor Innis' recent book *The Fur Trade in Canada*, and to W. B. Munro's standard work, *The Seigneurial System in Canada*. One is grateful to the industrious and capable editor, but he has perhaps been overgenerous in a book designed for undergraduate use. Only a fraction of this volume and its promised companion, together with Dr. Shortt's two volumes (and their promised additions), Professor Munro's volumes on seigneurial tenure and Professor Innis' own book on the fur trade, can be tasted by any undergraduate class. For the undergraduate's ingratitude, however, the thanks of the graduate and research student will be compensation.

Among the most interesting sections of the book are the general introduction and the introductions to individual sections. They are most suggestive and give the reader an inkling of a general point of view in the mind of the editor, an interpretation, if you will, of the economic history of Canada. They are, however, tantalizingly short and raise questions to which an undergraduate will hardly find answers in the documents quoted. One wishes that Professor Innis had let himself go in the introductions even if thereby we had lost a document or two.

The collection as it stands is comprehensive and complete. There are no important omissions. There are some minor typographical errors, but they are not misleading. The whole collection is a monument of careful painstaking scholarship, which leaves all students of Canadian economic history permanently in the editor's debt.

W. A. MACKINTOSH

QUEEN'S UNIVERSITY

Principles of Economics. By F. B. GARVER and A. H. HANSEN. Boston: Ginn & Co., 1928. Pp. x+726. $3.00.

It seems to the reviewer that teachers of a first course in economic theory should find this a highly satisfactory text. The volume is divided into five books dealing respectively with production; value; money and prices; distribution, both functional and institutional; and international economic relations. Much of the treatment of value and distribution is distinctly Marshallian, but without the discursiveness of Marshall's *Principles*. Much space is devoted to the problem of value, and some of the chapters presenting doctrines of cost are rather abstract; but the exposition is aided by extensive use of simple graphs, and in other sections liberal use has been made of statistical charts and tables.

Admittedly the work has faults. For example, in the sections on value and on functional distribution there are instances in which the authors evidently shift unconsciously from assumptions of competitive conditions to those of partial monopoly. Thus, in discussing elasticity of demand, it is stated that the chances are slight of an *individual business unit* increasing its sales much by price-cutting if the collective-demand schedule for the product in question is inelastic. Turning to interpretations of economic events, one finds that in the chapter on business cycles the authors describe the period from the middle of 1922–28 as one of rather stable commodity prices and attribute this stability largely to the discount policy of the Federal Reserve banks. They fail to note, however, that recent prices have been stable only by comparison with those of the war period, and that if one measures the amplitude of the cyclical swings of prices in terms of percentage decline to and rise from the successive low points of Bradstreet's index, the average fluctuation from the middle of 1922–28 is found to have been greater than that for the period 1900–1914.

But the merits of the book far outweigh its faults. Each chapter closes with a well-chosen list of statements and problems for discussion, and the volume as a whole achieves an excellent balance between formal exposition of economic theories and the application of these in the interpretation of contemporary economic life.

GARFIELD V. COX

UNIVERSITY OF CHICAGO

Production Organization. By JOHN D. BLACK and ALBERT G. BLACK. New York: Henry Holt & Co., 1929. Pp. xi+646.

This text, a "revised, abridged and simplified" edition of the senior author's *Production Economics*, is designed to supplant the materials of the usual descriptive approach course for first-year students in economics or business. Factual statements are not lacking in *Production Organization*, but they are more or less successfully related to the body of principles which govern the intelligent adjustment of production to a given price situation. After the student has devoted a half-year to this phase of economics it is the plan of the authors that he should proceed to a study of value and distribution. The workability of such an arrangement is evidenced by its success in various institutions.

To teachers of beginning economics this revised edition should be welcome. For elementary instruction it possesses most of the merits and few of the faults—both considerable—of the first edition. The descriptive materials are well chosen and as good as could be expected in view of the extent of subject matter covered. The exposition of principles is, with few exceptions, excellent. It would be difficult to find in an elementary text a better treatment of diminishing returns, the economic combination of the factors, or the principle of comparative advantage. Among the improvements in this edition are the more adequate treatment of marginal cost and marginal productivity and the inclusion of numerous illustrations from business as well as agriculture.

After a careful comparison of *Production Organization* with its forerunner one gets the impression that the authors have profited by the criticisms which they have received. The serious errors which marred the first edition have been largely eliminated, in some cases by correction but more frequently by omission of the difficult theoretical sections.[1] Although these omissions have undoubtedly resulted in a better elementary text, they have left it nearly devoid of interest for the advanced student. Most of the errors remaining in *Production Organization* are of minor importance and will not lead the reader astray. A few, however, should be noted. In smoothing the total-output rectangles, the curve is drawn through the middle of the top instead of through the upper right-hand corner of the rectangles (pp. 111–15, 123).[2] The

[1] A discussion of some of these errors will be found in "Some Notes on Black's *Production Economics*," p. 698, this *Journal*.

[2] The cumulative curve and scale are correctly located with reference to each other. Both must be shifted one-half an interval to the right to be in proper relation to the average and marginal-product rectangles and curves.

discussion on pages 151–52 and 158–59 reveals the persistence of the notion that the total physical product can be subdivided into separate, individual contributions of each of the various factors.[3]

In the balance *Production Economics* and *Production Organization* weigh as substantial accomplishments. Without doubt they belong to that important group of books which bridge the gap between abstraction and reality.

THEODORE O. YNTEMA

UNIVERSITY OF CHICAGO

The Financial Organization of Society. By HAROLD G. MOULTON. Third edition. Chicago: University of Chicago Press, 1930. Pp. xxxviii+752. $4.00.

In the original preparation of the book under review Professor Moulton rendered an inestimable service to American teachers of economics. That service was by no means limited to the specialists in the field of money and banking. The analysis which he supplied of the part played in modern economic organization by our sundry financial institutions is little short of indispensable to the study of almost every phase of economic life. The appreciation of this service is attested by the widespread use of the book in American colleges and universities and by the reprintings and new editions which market demand, in less than a decade's time, has made necessary.

The changes that appear in the third edition are, of course, in some degree those which one would expect. Factual material has been brought down to date and new developments of detail have been duly noted and appraised. But even here, however, it will be recalled that, since 1925, when the second edition was published, changes in the financial field, particularly in America, have been almost revolutionary. The rise of the investment trust, the spread of chain and of branch banking, the development of the "new era" craze in the stock market, and the new orientation in Federal Reserve policy which this induced, the rapid development of instalment selling—to say nothing of America's growing stake in international finance and of the establishment of the Bank of International Settlements—have put an entirely new face on American finance. Hence if Professor Moulton had done noth-

[3] This is discussed at greater length in the notes on *Production Economics*. (See above, p. 698.)

ing in his new volume but to work into the old structure an analysis and an interpretation of the most significant of these changes in practical procedure, his labors would have been amply justified. He has, however, gone farther. Profiting by his own varied experience as president of the Brookings Institution and taking advantage of five years of mature observation and reflection he has in various significant ways reorganized the philosophical structure of the book. The present volume impresses one not only as being more comprehensive than its forerunners but also as being more closely integrated, more unified—the product of wider comprehension and deeper insight.

It is not contended, however, that, with all its excellences, it is beyond criticism or above the individual teacher's need for modification. Professor Moulton would himself be the last one to bring forward such a contention. The work remains one primarily of analysis and of description with important theoretical points left undiscussed or hanging by threads of doubt. One might question, for example, the point that gold rather than money itself is the standard of deferred payments—whatever be the relation between money and gold—and this suggests further that the whole question of the monetary standard should really be discussed before one undertakes to deal with that of regulating coinage and currency-issue. The standard question and the theory of money value is also involved in the theory of the foreign exchanges.

In other words, despite the comprehensiveness of this new edition, there is plenty of work left for the teacher to do. There is a wide margin of flexibility and adaptability in the use of the book in the classroom. It is essentially an introductory volume; but as such it will stimulate the interest of the student, stir up the imagination of the teacher, and lay a solid foundation for a whole series of advanced courses in financial theory and practice.

E. E. Agger

Rutgers University

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By ERNEST MINOR PATTERSON

Professor of Economics, University of Pennsylvania; President, American Academy of Political and Social Science

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HOW can this world, made up of nations increasingly dependent upon each other for so many things, satisfy these conflicting and clashing economic wants—and yet maintain the independence of its political units?

Essentially, this is the dilemma with which this book is concerned. No panaceas are compounded or ready-made solutions recommended. Instead, it is the aim of the author to project a clear-cut and detailed perspective of the whole world's present economic status, and to indicate the sources from which relief may come. Most important, the stresses and strains of peace-time as well as the factors which lead to war are both carefully evaluated and made clear.

One after the other he describes and analyzes the problems set up by population growth and pressure, by the unequal distribution of nature's resources, by the growth and complexity of modern business and industrial structures. Then, he discusses in detail the economic activities of various national governments, reviewing particularly the recent economic development and current economic situation of Great Britain, France, Italy, Japan and the United States. And finally, he treats of the movement now in process of evolution which should, preserving political independence to national groups, furnish a means of economic cooperation, and thus answer one of the most vital questions which the world at present faces.

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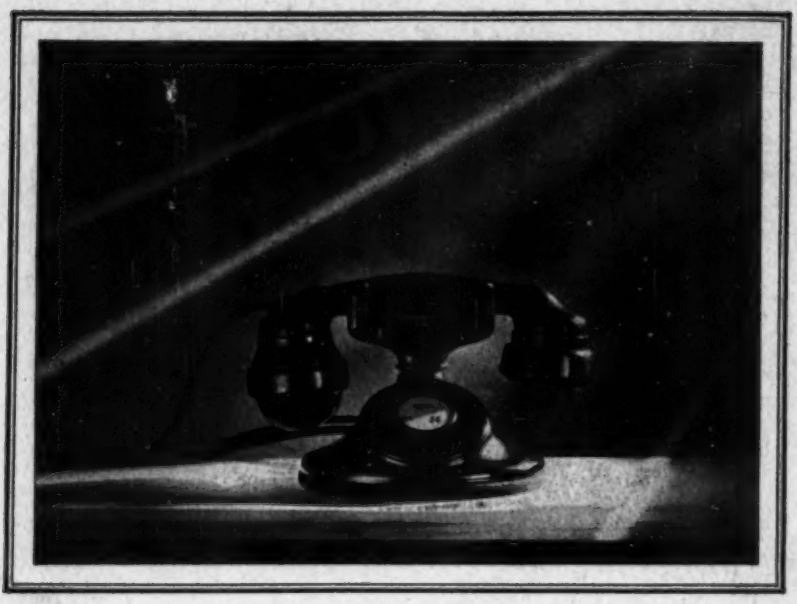

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